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PERCEPTIONS ON SOCIAL NETWORKING: A STUDY ON THEIR OPERATIONAL RELEVANCE FOR THE NAVY

by

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March 2010

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13. ABSTRACT (maximum 200 words)

Since the beginning of civilization, humans formed social networks under communities bound by common interest. Today the ubiquity of the Internet provides ample opportunity for these groups, once limited by geography, to connect easily and expand beyond city and national borders. The U.S. Navy provides an opportunity to harness the power of electronic social networks to improve enterprise-wide information sharing across strategic, operational, and tactical forums. These networks of trusted connections among people ensure means for watch standers and decision makers to share trusted information with seasoned leaders and subject matter experts. The leverage of electronic social networks in the Navy is significant during manpower reductions that present limiting opportunities for face-to-face collaboration and mentoring, a critical aspect to a war-fighting organization. This thesis presents an evaluation and comparison of the perceptions of social networking of current and future leadership on the value of social networking tools. Moreover, this analysis applies specifically to Navy operations. The relevance of collaboration, trust, professional development, and technological opportunity is examined.

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ABSTRACT

Since the beginning of civilization, humans formed social networks under communities bound by common interest. Today the ubiquity of the Internet provides ample opportunity for these groups, once limited by geography, to connect easily and expand beyond city and national borders. The U.S. Navy provides an opportunity to harness the power of electronic social networks to improve enterprise-wide information sharing across strategic, operational, and tactical forums. These networks of trusted connections among people ensure means for watch standers and decision makers to share trusted information with seasoned leaders and subject matter experts. The leverage of electronic social networks in the Navy is significant during manpower reductions that present limiting opportunities for face-to-face collaboration and mentoring, a critical aspect to a war-fighting organization. This thesis presents an evaluation and comparison of the perceptions of social networking of current and future leadership on the value of social networking tools. Moreover, this analysis applies specifically to Navy operations. The relevance of collaboration, trust, professional development, and technological opportunity is examined.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACFEA   Armed Forces Communications and Electronics
            Association

ADM   Admiral

AKO   Army Knowledge Online

BWC   Battle Watch Captain

CAC   Common Access Card

CAS   Collaboration at Sea

CENTRIXS   Combined ENTerprise Regional Information eXchange
            System

CIA   Confidentiality, Integrity, and Availability

CIO   Chief Information Officer

CJCS   Chairman of the Joint Chiefs of Staff

CO   Commanding Officer

COE   Centers Of Excellence

C2   Command and Control

DCO   Defense Connect Online

DKO   Defense Knowledge Online

DoD   Department of Defense

FBI   Federal Bureau of Investigation

IA   Information Assurance

IO   Information Operations

IRB   Institutional Review Board

IT   Information Technology

JWICS   Joint Worldwide Intelligence Communications System

MOAA	Military Officers Association of America
NIPRNET	Unclassified (but sensitive) Internet Protocol Router Network
NKO	Navy Knowledge Online
NNOA	National Naval Officers Association
NPS	Naval Postgraduate School
O-Club	Officers Club
OPSEC	Operation Security
RADM	Rear Admiral (upper half)
SCINET	Secure Compartmented Information Network
SIPRNET	Secret Internet Protocol Router Network
SN	Social Network
SNA	Social Network Analysis
TAO	Tactical Action Officer
TISC	Transnational Information Sharing Cooperation
TLAM	Tomahawk Land Attack Missile
TTP	Tactics, Techniques, and Procedures
USNI	United States Naval Institute
VADM	Vice Admiral
VIRT	Valued Information at the Right Time

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I. INTRODUCTION AND BACKGROUND

This thesis investigates how social networks impact operations in the U.S. Navy today and the perceptions of how social networks will shape the Navy of tomorrow. New tools increase connectivity and availability of information for decision-makers. The Navy leadership recognizes a shift in effective communication among collaborating assets separated by time and distance.

> Tactical employment of social networking in the midst of operations can be very successful as well. Use of chat and shared blogs delivers a richer situational awareness, especially when combined with a common operating picture developed from fused information sources.
>
> —RADM J. Hamby

Electronic social networking emerged as a powerful communication medium that transcends many of the barriers to effective communication. As the amount of data collected increases, the ability to process it into actionable information and disseminate it wanes. Shifting cultures from "need to know" to "need to share" will not be easy, but it appears necessary. (VADM N. Brown, 2008) Social networking may be the key to making that fundamental shift and engendering a mindset of information sharing.

A. MOTIVATION AND OVERVIEW

As America enters the second decade of the 21st century, it is useful to assess the world situation and the foreign entanglements the U.S. committed its resources to. As of 01 January 2010, the United States is currently

engaged in both Iraq and Afghanistan; actively pursuing members of al-Qaida, suppressing Taliban control, and chasing down every lead on impending terrorist attacks against the U.S. within its power and considerable resources. The truth is that America's vast resources are spread thin, despite the billions spent in pursuing those responsible for the 9/11 attacks. But, how is it that al-Qaida is able to operate and persist with such a staggering disparity of men, materiel, and capital? Exploitation of social networks catalyzed al-Qaida's ability to communicate, organize itself, and (as a result) continue the fight. The U.S. and its coalition partners did not sever these networks nor cripple terrorist activity despite best efforts.

Beginning in August 2009, a rapid transformation in policy and usage of electronic social networks are observable in the U.S. Department of Defense. Strategic leadership, including Chairman of the Joint Chiefs of Staff and Unified Combatant Commanders, are now actively using Facebook and Twitter and other tools to broadcast a coherent message to service members and the public. Strategic leadership can likewise hear directly from the voices of those listening (Thejointstaff, 2010).

The U.S. Marines banned social networking sites on Marine Corps Enterprise Network (MCEN) NIPRNET effective 03 August 2009 as per MARADMIN 0458/09. The purpose of the ban, which remains in effect, is to minimize exposure of MCEN systems to threats that compromise OPSEC, COMSEC, and personnel themselves (Commandant of the Marine Corps (CMC), 2009).

In contrast to the Marine Corps' comprehensive curtailing of electronic social network usage, Admiral Mullen, CJCS, sent a strong signal via Twitter[1] the following day, "Obviously we need to find the right balance between security and transparency. We are working on that. But, am I still going to Tweet? You bet." (ADM Mullen, 2009)

Currently, many senior commanders commands, and communities maintain an active presence on electronic network sites. This includes The Joint Staff, U.S. Pacific Command, U.S. European Command, and the Navy Information Professionals community.

Twenty-first century communications are changing, that much is certain. But, will the Navy lag the wave of the future or precede it? The only way to know for sure is to venture into the unknown and experiment with new technologies for which the impact has yet to be determined for naval operations. At a minimum, we must endeavor to understand social networks and know how America's enemies will attempt to use them against us.

B.   SCOPE AND METHODOLOGY

The Department of Defense (DoD), including the Department of the Navy, is currently tasked with improving the cooperation between the military services, other government agencies, and our allies as outlined in the Commission for National Security in the 21st century. In this report, it states the need to "reap the benefits of a

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[1] Twitter is a micro-blog (140 characters max) social networking tool used for burst communication worldwide. Examples of Twitter feeds can be found in Appendix A.

more integrated world in order to expand freedom, security, and prosperity for Americans and for others,"(United States Commission on National Security for the 21st century, 2000). So far, organizational change is slow within the Navy and greater DoD for putting mechanisms into place that allows for extensive collaboration of valuable information. If the military is to remain viable in the Information Age, collaboration and networked command and control (C2) capability will be paramount in preventing its obsolescence.

As stated in the DoD's Information Sharing Strategy,

> It is imperative to effectively exchange information among components, Federal agencies, coalition partners, foreign governments and international organizations as a critical element of our efforts to defend the nation and execute national strategy. Through this Strategy, the Department will achieve improved unity of effort, a reduction in decision time, increased adaptability of forces, improved situational awareness, and greater precision in mission planning and execution.(Grimes, 2007)

This excerpt form the DoD strategy implies that communication is critical to undertake; yet currently these ideas only exist on paper. True, many tools exist across government agencies and the military for communication, but none fuse information between all players in a comprehensive manner.

Particularly for the Navy, a hodge-podge of collaborative tools exist, some up to 15 years old. These aging systems operate in conjunction with newly integrated IT systems in the fleet, often situated right next to each other in the communications shack. This in of itself does not pose a problem; in fact, the Secretary of the Navy might

argue it is pure business sense to acquire the most value out of an IT investment. However, the increasing complexity of integrating systems together, and subsequently to joint and coalition IT systems poses significant challenges.

Using social networks to close communicative paths and establish connections between agencies, departments, and other friendly nations promises potentially explosive outcomes. "Building a culture of trust, where we enable collaboration…" opens the door for information exchange, while "[c]hanging practices that stifle information sharing…" addresses the cultural reluctance to collaborate.(Interview with Director for C4 Systems, The Joint Staff (J-6) Vice Admiral Nancy E. Brown.2008) The actual benefit that social networks provide is disseminating information to those who need it, when they need it. Do these networks form naturally or are they the product of leadership and organizational policy? Research was essential to finding the answer to this question.

For this research study, the researchers targeted two groups for data collection: (1) Navy flag officers and DoD senior leaders; and (2) resident students at NPS in the Information Professional (IP, 1600) and Human Resources (HR, 1200) communities. These two distinctly different subject groups provide unique views on how social networking affects naval operations, not just to compare and contrast, but more importantly to identify whether the groups believe these networks add value to the Navy mission.

Choosing Navy leaders to interview for social networking research was no simple task. Albeit some were obvious (proponents such as ADM Mullen) finding other

persons of influence to social networking varied. Some were chosen by virtue of their position within the Navy command structure or the nature of their job. Others, however, were selected for their documented use or disuse of available electronic social networking mediums.

Selecting a suitable student population to survey was based on two basic principles. First, the IP community represents the communication experts of the fleet. The Human Resource community is interested in how social networking changes personnel management in the Navy. Second, as members of these two communities, the researchers obtained support on the importance of this research and perhaps insight on the interpretation of responses from individuals with similar training and background.

An interview-based method for flag-level input elicited the necessary input from a senior military leader perspective. Interviews allowed for a more open discussion on the perceptions of social networks, any value added, and how these tools affected the Navy. It was important that the researchers understand senior leader perceptions, including any context or experiences that helped shape those views. Although finding senior leader participation provided great insight for our research, it also required additional layers of protection, like informed consent.

C.   RESEARCH QUESTIONS

What is the perceived relevance of social networks to Navy operations?   This constitutes the primary research question, which this thesis seeks to answer.   Other

important questions that address key aspects of social networks in the military, and reinforce this research are:

- In what ways are social networks adding value to the Navy?

- What implications do social networks have on the way the military communicates?

- What are the cultural factors regarding use of social networks?

D.   BENEFITS OF STUDY

This thesis provides Navy leadership with observations on the subject of social networks, their origins, unique characteristics, and future potential. This research is accompanied with data that describes how other Navy officers perceive the implications of social networks. Combined, it suggests several ways that social networking may effect change across the organization, and how it is relevant to the Navy.

The perceptions and ideas contained within this document plant the seeds for more detailed studies on the topic of social networking. It is important to note that this qualitative study frames social network precepts to stimulate follow-on research.

E.   ORGANIZATION OF STUDY

Subsequent chapters will focus on social network concepts, our research methodology, the study's results, and final conclusions. Below are synopses of each chapter's contents:

Chapter II: Social Networks

The intent of this chapter is to orient the reader with social networks. The principle concept of what comprises a social network, its characteristics, relationships, and underlying value are discussed.

Some background of social networking studies is presented, in addition to related analysis models. Following, the researchers present examples of social networking as powerful assets for organizations. The authors hope to stimulate thoughtful discussion on what social networks can offer to military operations. Trust, in particular, influences what kind of information is shared among nodes in a network, how often it is shared, and whether it is shared with all or select members of that network based on levels of confidence for an organization.

Chapter III: Methodology & Data Collection Plan

The authors collected data from naval officers in order to test a working hypothesis and intuition whether the Navy's leadership had a positive perception of the potential for social networks. Data collected had to provide evidence on whether social networks provide value to military operations. A data collection plan was designed to capture opinion on social networking from both current and future Navy leaders.

Chapter IV: Perceptions of Social Networks

The focus of this chapter is to identify trends in perception of social network utility for military operations. The data was obtained from senior leadership and junior managers following our research methodology. The

results are discussed by an experimental test group; flag officers followed by junior officers and then comparatively.

This analysis is based upon the participant's perceptions instead of hard numerical data. For example, we did not ask the subject to log their usage before taking the survey, therefore any answer given is based on the perceived utilization rather than actual utilization. Consequently, the results are statistically limited, which is consistent with a qualitative study.

Chapter V: Conclusions and Future Research

The objective of this chapter is to summarize the research and reiterate what has been learned about social networks and its impact on future naval operations. It will also provide recommendations for how to proceed and where communications in the near future are headed for the Navy.

The next section focuses on valuable follow-on research that should be conducted but was outside the scope of this study. These findings combined with research already conducted will provide the Navy a more comprehensive understanding of how social networks can be leveraged to significantly improve Navy operations.

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II. SOCIAL NETWORKS

Social networks are the instantiation of connections between people (Liebowitz, 2007). Information flows among participants, and trusted connections result from this information sharing. Such a network may be purely social, or based upon professional association, or a combination of the two. Arguably, origins of these networks extend back to when man first walked the earth. While social networks are formed on the basis of a common denominator (e.g., club membership, family, hobby, etc.), a subset of the networks is based on relations of trust (Tilly, 2005).

A. WHAT ARE SOCIAL NETWORKS?

Social networks are systems of connectedness that associate people with knowledge. They provide connections for the flow of information, whether in a face-to-face forum or its modern electronic equivalent. Software, hardware, and buildings provide environments in which social networks exist and evolve (Liebowitz, 2007). A social network is not the collection of hardware, software, or conference rooms used for communication; it is the connection between people that matter. These networks of people are what the researchers seek, as they prove to be both interesting and relevant in today's organizations.

Traditional forms of social networks include those that manifest in specific places, such as "brick and mortar" club houses, in which the organization's purpose may be to focus upon pursuits of recreation, intellectual discourse, professional growth, or perhaps civic service. Examples of

such include Lions Club International, Kiwanis, or a ship's Wardroom. Electronic social networks, in contrast, take place in the notional domain of cyberspace. Here, Web browsers on personal computers typically provide access for connecting members to the hosting computer servers. Facebook, Twitter, mIRC (chat), LinkedIn, and Govloop are familiar examples of online meeting places.

The desired end-state of electronic social networks is comparable to its traditional counterparts, without the advantages (or inconveniences) of a physical meeting requirement. In addition, electronic information may be exchanged in either real-time, such as chat, or non-real-time, such as exchanging ideas in a public discussion boards. More importantly, electronic connectivity offers "intimacy achieved through immediacy" that surpasses inconveniences associated with information sharing over great distances (Stephenson, 2001). The focus of an electronic network is to rapidly disseminate relevant information to a group of similarly interested people.

Other groups, like Al-Qaida, successfully maintain social networks whatever they can, relying on either human networks or using the Internet and other electronic mediums (e.g., cellular and satellite communication)—and do use them to great effect.

> They use [the Web] to communicate amongst themselves and to reach out to supporters, the media, governments, and the public. They use it to exchange messages and engage in online discussions."(Denning)

E-mail, blogs, online forums, and other social networking media all provide conduits for terrorists to communicate

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with one another and at far less cost than what the U.S. military spends to keep its communications up.

Navy leadership also sees the value in using social networking tools to magnify strategic messages, provide redundancy along existing message routes, and maybe one-day act as the principal means of communication in an operational environment. Admiral Mike Mullen (CJCS), comments on the relevance of social networking for future military operations.

> For leaders, ... it's really important to be connected to [social networking] and understand it, ... I think communicating that way and moving information around that way – whether it's administrative information or information in warfare – is absolutely critical.(Office of the Assistant Secretary of Defense (Public Affairs))

Jack Harrison, the Director of Public Affairs for the U.S. National Guard references a critical shift in how the military will conduct business in the future:

> The old way of communicating — internal communications or command information, external communications or media relations and community relations — is a 20th century model.(Greenhill, 2009)

1.   Networks Are Powerful

As an illustration of the power of social networks, one of social networking's earliest experiments is briefly described. Although the participants were not members of a specific social organization, they did demonstrate connectedness to each other, in that each participant knew someone who was one step closer to the desired target.

In a 1967 sociometry study, researchers Jeffrey Travers and Stanley Milgram published *An Experimental Study of the Small World Problem* in which they examined the degree of separation between any two people in the United States. For example: how many randomly selected people know how to reach a specific individual, who is not a celebrity or other well-known individual? The "Small World Problem" demonstrated just how *small* the world is, thanks to social networks.

In the study, 264 individuals who were living in Nebraska and Massachusetts were asked to start "acquaintance chains" to a "target" person. The target person was a stockbroker who worked in Boston, Massachusetts and lived just a short distance away in the town of Sharon. The participants were divided into three groups: two groups from Nebraska mostly consisting of stockbrokers (included a small number of people with no special access to the financial industry), and a third group of randomly selected individuals living in Boston. Each participant was provided a packet with instructions, requesting the packet be forwarded, via postal mail, to a first-name acquaintance. The intended recipient was chosen based on the likelihood of them knowing the stockbroker, or perhaps someone who directly knew him (Travers & Milgram, 2006).

Of the 296 initially selected participants, 216 of them (76 percent) chose to participate in the study and forwarded the document to friends. Sixty-four packages (29 percent) eventually reached the target, out of the 216 people who were initially contacted. In the end, the mean chain length

(a.k.a. degrees of separation)[2] was 5.7, contrasted with 4.4 of the Boston random group. This shorter chain length should not be surprising, as pointed out by the study's authors, as the geographic distance separating the Nebraska group from Sharon was 1,300 miles, in contrast to an average 25 miles between the Massachusetts' participants and the target's hometown.

Travers and Milgram suggest some of the participants may be skeptical about the likelihood of the package reaching the target. "People have poor intuitions concerning the length of acquaintance chains. Moreover, people can rarely see beyond their own acquaintances." (Travers & Milgram, 2006) The study illustrates the power of social networks. In today's wired society, networking is increasingly popular (even necessary) as people have fewer opportunities for face-to-face interaction. Computer-mediated communication provides a convenient way to exchange ideas, share information, and transact business in a time-constrained environment. While modern electronic networks feature convenience and speed, the tangible benefits from face-to-face networking, like trust, are still very difficult to reproduce in electronic mediums.

2.   Yet, Networks Have Limitations

Traditional social networks that require in-person meetings have disadvantages, including the inconvenience of meeting prerequisites (i.e., pre-meeting tasks, travel time, and building access), and some real costs (e.g., facility

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[2] Milgram defined 'mean chain length' as the number of people who handled the package until it reached its destination.

overhead, staff salaries). However, this "brick and mortar" approach does have its merits too. Members can be fairly certain their conversations are private; their gatherings are unlikely to be observed by uninvited persons. In addition, in-person meetings provide direct observation to subtleties of body language, tone of voice, drawn diagrams, and a natural flow of discussion that offers context and feedback for more meaningful conversation (Bordia, 1997). This element of communication is more difficult to convey in an electronic medium effectively. This natural flow of communication is something to which humans have grown accustomed, so when those subtleties are absent it is noticeable.

There are other risks to using electronically based communication mediums too. Cyber criminals present threats to an organization's Web server confidentiality, integrity, and availability. These thieves have the luxury of time and distance to inspect potential break-in methods from the comfort of Internet cafés on their own schedule, from any where on the planet. If not detected and stopped by authorities, they can continue to probe for potential system weaknesses until ready to compromise the system, steal, and modify data. These modern collaboration tools enjoy advantages as well, too.

First, the incremental costs for installation of a modest server, software, and necessary administrative support will be far less than a facility. The costs can be reduced yet further by leveraging free or low-cost services on the Internet. Second, the savings of travel time, expenses and related stress of meeting participation as

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compared with the traditional travel is remarkable. As the workforce becomes untethered, ushered in with the advent of smart phones and laptops, workers are sharing expertise and information remotely among a larger community than before.

> Certainly, online communities can greatly facilitate the sharing of information and knowledge with others, hence building shared values and further developing an individual's social network. (Liebowitz, 2007)

B.   TRUST AS A KEY INGREDIENT OF SOCIAL NETWORKS

One defining quality of social networks is trustworthiness. Without trust, a social network is little more than a group of people who discuss topics with each other without the essential bond of credibility. In the information domain, lack of trust may manifest itself as a public chat board in which opinions are articulated, without a network of trusted colleagues to depend upon for candid discussion, debate, and resolution.

   1.   What Exactly Is *Trust*?

"Trust is the trustfulness of a trustor: the extent to which the trustor is willing to take the risk of trust being abused by the trustee."(Buskens, 2002) Therefore, if two people are considering entering into a business transaction, trust plays a big part. If one business partner proves untrustworthy, then future transactions are jeopardized. This represents a loss of opportunity to both parties.

Normally, trust must be earned through observation of another person's dependability and adherence to professional and/or personal ethical behavior. Trust is built upon the

essential quality of respect. Organizations accelerate trust building among its members through tradition, established codes of conduct, and regulations. The U.S. Navy is an example of such. When a senior officer enters a room where subordinates are gathered for a meeting, everyone stands at attention, indicating their deference to the senior officer. The subordinates' respect for the senior officer is integrated in to the service members' training since the first days of military indoctrination. Respect serves as a fundamental element within the military, and trust follows. With today's high caliber of military professionals, this bond of trust and respect is earned and exists in both directions of the senior/subordinate relationship.

> Supervisor loyalty implies an understanding not to take advantage of subordinates. Subordinates then believe their efforts are genuinely appreciated. As a consequence, subordinates may be less likely to complain about trivial matters...and more inclined to report to duty even though a socially acceptable excuse is available.(Deluga, 1995)

Once trust is firmly established, the "benefit of the doubt" provides an information receiver some assurance of the quality of information. This is in contrast to information provided from someone with whom the receiver has no such trust relationship.

Social networks provide alternatives to information sources sought out by the participants. If the "trustor" (seeker of information) does not trust a particular source of information, perhaps based upon first-hand experience, or

second-hand   information   (other   network   participants
opinions), the trustor can seek out alternative "trustees"
(information sellers) (Buskens, 2002).

2.   Networking with Trust for Survival

Social   networks   have   been   used   for   the   continued
operation   of   an   organization   or   even   the   lives   of   the
members.   During   the   12th-17th centuries,   non-Catholic
Christians living in France depended upon networks for their
survival. The Catholic Church pursued the Waldensians (or
"Valdès"),   denouncing   them   as   heretics,   and   worthy   of
execution.   The integrity of their trust network, and their
lives, depended upon the loyalty of all members.

> A singly spy, defector, or weak-kneed victim of
> the   Inquisition   could   cause   the   Waldensian
> network   atrocious   damage.   Trust   networks
> organized around kinship, long-distance trade, or
> workers' mutual aid rarely face the threats of
> death and dispossession regularly experienced by
> the   Valdès   followers   [who   were   not   part   of   the
> network].(Tilly, 2005)

As an example of network preservation relevant to the
Overseas   Contingency   Operation,   a   Web   site   posting   on   a
jihadist Web site in October 2008 warned members to watch
for content contributors who intend to create disharmony on
their social network. Warning of "intellectual discord among
the mujahidin," the network member who warns others about
"certain groups" who seek to "ignite the fire of turmoil
either by the topics they post of by their participation or
responses."(*Jihadist   Forum   Member   Warns   of   'Intellectual
Discord' in Forums*.2008) The member is concerned the alleged

discord purveyors will impact the trustworthiness of their social network, and thus its value.

C.   WHY DO SOCIAL NETWORKS REALLY MATTER?

Our society is in a constant state of flux. As technology and jet travel continue to virtually "flatten" our planet, the demand for increasing amounts of information and resources also increases, so as to fuel advantage for competition among nations as well as private enterprise. Organizations must keep up with the ever-increasing rate of change, so as to limit problems from (and look for solutions to) resulting crises. Examples of crises include tribal or national strife over land, or multi-national competition for natural resources that are discovered in a poor "developing country". Ackoff writes in *Redesigning the Future*: "Society does not yet know how to respond rapidly and effectively to these crises and it may not learn how to do so in time. Therefore, there is an urgent need to change our society in ways that increase its ability to learn and adapt." (Ackoff, 1974) He describes the trend for diminishing learning effectiveness from experience, (as the opportunity for timely experience shrinks). We live in a fast-paced world of the Dilbert "Bungee Boss"(Adams, 1994) and on-the-run Twitter.

D.   ORGANIZATIONAL KNOWLEDGE CREATION

Social networks are powerful. More than enablers for connecting people who may not know each other directly, or solely providing a conduit through which information can flow, networks facilitate creation of knowledge. Scholar Nonaka observes that although individuals form ideas, the

"interaction between individuals typically plays a critical role in developing these ideas. That is to say, "communities of interaction" contribute to the amplification and development of new knowledge." (Nonaka, 1994)

The concept of knowledge creation via social networks is significant, as arguably the networks are simply collection of individuals, and therefore the ideas are from specific members. Individuals have historically produced outstanding works of art, literature, and technical advances. Is the value-add of social networks a computationally simple concept, or an abstract idea?

Nonaka observes four different "modes" of knowledge creation may take place between that which is explicit (that which is easy to write down or store on a computer), and that which is tacit (beliefs, perspectives, experience – much more difficult to extrapolate). Knowledge is converted from one mode (tacit or explicit) to another (explicit or tacit), for a total of four modes. As an example, the recombining, editing, and sorting of explicit knowledge via modern information systems, for creation of new explicit knowledge is called "combination" (Nonaka, 1994).

Organizational knowledge is more than the reshuffling existing information already known by the group. It involves human skill for building new information and forming connections with existing knowledge. Organization of a continuously increasing amount of institutional knowledge is a huge challenge to any organization. How does the organization get its collective hands around what information is known in the first place? Following 11 September 2001, disparate, outdated information systems at

the FBI hindered efficient progress of analysts and agents from quickly forming connections between pieces of information, *which the FBI already had* (Goldstein, 2005). The indexing of knowledge for subsequent retrieval is a complex task best left for information storage experts and computer scientists. The value added by humans of creating knowledge is far more powerful than the storage and retrieval of existing knowledge.

In *The Design of Inquiring Systems*, C. West Churchman opines that authors of research and science literature assume their readers understand the meaning of a "collection of information". Apparently, they think of a "collection" in terms of a library, and a systematic collection to be like an efficient library with an adequate indexing and cataloguing system. However, no library qualifies as an entity having a "state of knowledge"[…]. The authors would say that the state of knowledge resides in the combined system consisting of the library and an astute and adept human user (Churchman, 1971). Thus, the human user works as the connection mechanism that brings the value of the library's information storage.

The human who at the modern information system and participates in a knowledge network is a member of the network, as he (or she) reviews the information found online, evaluates its validity, and considers its relevance for a specific problem. It is quite possible (and the researchers hope that) the operator will in turn contribute insights and "lessons learned" back into the knowledge network, thus adding his own value towards the benefit of other human participants. As knowledge network participants

contribute data to the network, framed by their experiences and wisdom, they create knowledge from which others may benefit. The "usability" quality of the information is provided.

E.   SOCIAL NETWORKING WITHIN ORGANIZATIONS

The researchers suggest that social networking could be a helpful tool for making the most of the available resources within an organization. Social networks' leverage could reduce the requirement for "organizational slack"[3], as the distribution of an organization's knowledge could be leveraged better than through alternative methods. The knowledge drawn from the social network can be applicable to all sorts of challenges, whether sought out by industrial factory-floor ("blue collar") employees, or the "white collar" leadership who work in the executive offices next door.

Social networks add value to both an organization's management and operations. In other words, the processes and procedures of an organization (whether it be the commercial market, federal employee, or military) can be enhanced to in terms of efficiency (squeezing more work out given the same resources) and effectiveness (getting work accomplished).

1.   Leadership

Members of the leadership can collaborate with each other in order to share best practices via social networking. The junior leaders (possibly fresh from business

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[3] Too many resources beyond what are required to satisfy demands (Eoyang, 1975).

school) can benefit from the wisdom and experience of the more seasoned members. Conversely, new business practices and industry trends taught at school can be shared between the newest employees and the senior leaders. Explicit knowledge can be readily exchanged among network participants, and through on-the-job training, tacit knowledge can be exchanged to a degree too (possibly supported by multi-media features of electronic networking). As a result, overall leadership can present a more consistent, dependable, effective presence to the organization. Members possessing expert knowledge in specific areas, as well as those who tend to not actively participate can be encouraged to share. This would diminish isolated network nodes of information. Once management nodes are established, other members can easily reach out to connect with established subject matter experts. In an example of a civilian company facing workforce reduction, Mishra, Mishra, and Spreitzer note the importance of management utilizing electronic communication to keep information sharing among stakeholders within the organization.

> Face-to-face communication is the best method for communicating about downsizing. But in the age of electronic communication, managers need to understand how to utilize many methods of communication in order to facilitate an ongoing dialogue with employees and other stakeholders, as well as how to be proactive about sharing company information…(Mishra, Mishra, & Spreitzer, 2009)

Aspects of manpower management need to be taken into account regarding the decisions of manpower managers. (Eoyang, 1975), including organizational slack. Eoyang

observes that realistically, organizations operate in either positive or negative slack (too much or too little resources for demands.) He continues with

> [the] "amount of work performed within a firm is a function of external market demands and also of the number of people inside the firm. Typically planning of production manpower consists of forecasting future workload and then determining the appropriate amount of labor to support the forecasts."(Eoyang, 1975)

2.   Worker Bees

The front-line workers benefit from access to established collective knowledge for researching business problems. This may include a new issue brought up by a customer who requires research, or an unfamiliar procedural/administrative question. Employees can seek out knowledge from each other, as well as tap in to the knowledge of the leadership if necessary. New explicit knowledge can be codified into the system, as new issues are encountered and resolved. This in turn will reduce the duration of "problem-to-solution lifecycle" for similar problems in the future. Morale of the employees will rise, as they are able to resolve problems more easily than having to use trial-and-error, or more intrusive methods for querying fellow employees (and leaders) for finding solutions on problems.

F.   STUDY OF NETWORKS—THE BROADER BACKGROUND

The study of networks can be traced as far back as 1736, when mathematician Leonard Euler studied a famous riddle called the Königsberg Bridge Problem (Newman, Barabási, & Watts, 2006).

"The city of Königsberg was built on the banks of the Pregel River in what was then Prussia, and on two islands that lie in midstream. A popular brain-teaser of the time concerned seven bridges that connected the islands to the land masses. "Does there exist any single path that crosses all seven bridges exactly once each?"(See Fig. 1) Legend has it that the people of Königsberg spent many fruitless hours trying to find such a path before Euler proved the impossibility of its existence. The proof […] makes use of a *graph*."
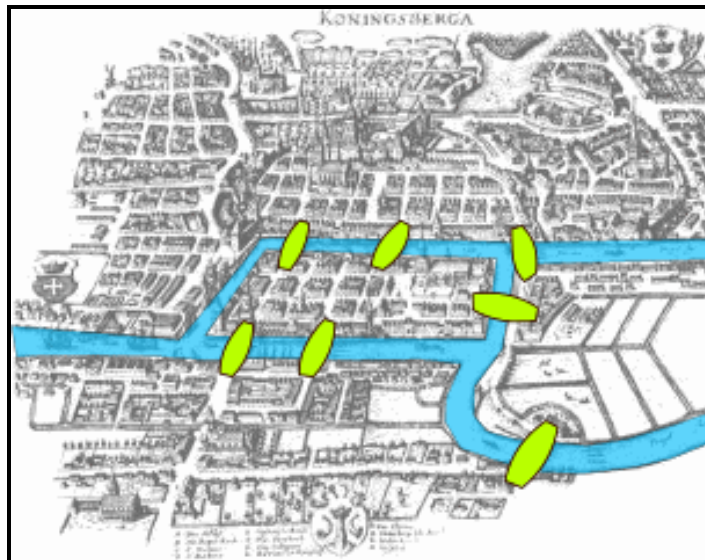
Figure 1.   City of Königsberg, depicting famous seven
bridges. (Giuşcă)

Through the use of graphing mathematical objects (graph theory), the original puzzle was reduced to a question of connectivity of *vertices* (nodes) and *edges (*links*) (Newman et al., 2006). By reducing the original problem, mathematical analysis of connectivity is facilitated. For this puzzle, Mr. Euler developed of a proof that there was no solution.

Beyond the interesting puzzle, the broader field of the study of networks was in its infancy. In the Königsberg Bridge puzzle, a series of interconnecting bridges formed a network. A network germinates by the connectedness of inanimate objects (computers, telephones, radios, interstate freeways) or people (friendships, career-related associations), or non-human animals (honey bees, ants). Subsequent research reveals networks have value added by each additional member n, and the overall network value is proportional to the number of other users. The value of the network for all users, per Metcalfe's law, is proportional to (n^2-n).(Shapiro & Varian, 1998) The emphasis here is that the definition of "networks" transcends mundane ones with computers. A network can be a system of elements that collaborate either for the long term, or ad hoc.

Due to a growing interest in using quantitative methods in the fields of social science, the language of mathematics was assimilated by sociologists and anthropologists (Newman et al., 2006). Ray Solomonoff and Anatol Rapoport discuss "probability trees" in their 1950 article *Connectivity of Random Nets* to describe hierarchical nodes of "first order", "second order", etc. The point of the tree was to provide a tool for estimating the likelihood of events occurring for nodes within the tree. For example, this tool could estimate the probability of an epidemic spreading throughout a population, or of connectivity between two specific nodes in a neural network.

G.   NETWORKS ARE INHERENTLY SOCIAL

Networks are interesting to study, as they are the connections between people. Unless we live completely alone,

we will necessarily be members of social networks, from our first contacts with our parents and siblings, to school classmates, friends, then co-workers, spouses, and other acquaintances. The networks define elements of who we are, and what we know, and perhaps to what we aspire to be.

Networks are powerful, as they facilitate a mechanism through which information can be created and shared. Information is of no value unless it is in the hands of those who need it, in a timely manner. Similarly, the information is of little value if it is untrustworthy. A network of trusted associates provides a vetting mechanism by which the information gets its validation. Electronic networks provide the mechanism for sharing information in a timely way, through an access mechanism that has the potential for being familiar, convenient, and trustworthy.

III. METHODOLOGY AND DATA COLLECTION PLAN

The perception Navy leadership has of social networking applicability to operations is interesting. How do the perceptions of current leaders compare with those of future leaders? The authors researched two groups: present senior officials, as well as junior officers within the Information Professional and Human Resources communities to find out.

A. MOTIVATION

The researchers collected data in order to test our working hypothesis and intuition that the Navy's leadership has a positive perception of the potential for social networks. We are interested in searching for trends in perception of electronic social network utility, with focus upon the potential for adding value to Navy operations. If surveyed representative groups indicated an increasing trend of support, the researchers would conclude the broader Navy leadership is growing more supportive in a corresponding manner.

In order to test that hypothesis, surveys and interviews were conducted with selected groups of military officers and senior DoD officials. Junior officers (O1-O4) representing the HR and IP communities at NPS formed the first group, while various flag officers consented to an interview with us. Due to time and distance limitations, such interviews took place over the Internet, video chat, or telephone.

The data obtained through the surveys and interviews were required to either support or refute our hypothesis.

This research was completely dependent upon gathered data, without which, this report would solely be conjecture.

In addition to testing the hypothesis, as the investigators for this thesis there is genuine interest on the potential for electronic social networks applied to Navy operations. The tools used to leverage the potential of electronic social networks will evolve to become increasingly intuitive to use, as demonstrated by the rapid evolution of personal communications devices in the consumer market. As the tools improve in usability, the adaptability for military applications will improve. As younger generations of service members join ranks, and as they progress through various duty assignments and pay grades, their influence to and expectations for how tasks should be accomplished will have an impact on how the Navy conducts its operations for the foreseeable future.

The perception of electronic social networks is based upon a person's experience with them, whether through first-hand observations or through reading publications and discussions with colleagues on the subject. When examining the perceptions of those officers who participated in our research, the authors will look for correlating data points that provides insight into what brings support for social networking.

While the researchers do not suggest that electronic social networking is a panacea, it is a communications medium, which continues to evolve in form and promise for future communications. Whether via Facebook or a Navy-specific system, using a desktop computer or handheld

device, or even ways not yet invented, electronic social networking will continue to grow in value.

What did it provide us in terms of research?

The research gave us data points from two selected groups of officers within the Navy: some of the data was based upon survey respondents selecting answers from a Likert Scale, while other answers were provided in brief essay-style answers.

The two groups of officers (juniors and seniors) selected represent both the current and future Navy leadership. In conducting this research, we were interested in discovering how the two surveyed groups perceptions were similar, and how they were different.

B.   METHODOLOGY

When collecting data, the researchers were interested in the perceptions of Navy officers regarding electronic social network applicability to Navy operations. The senior officers interviewed are those who are members of ranking leadership today. Their commands handle a wide range of key functions within the department of the Navy, and provide valuable insight into the views of broad senior leadership.

The junior officers represented our future leadership. As Lieutenants and Lieutenant Commanders, they will eventually be in the positions of senior leadership in a decade or so. However, their impact on Navy policy begins sooner, as they join command staffs, participate in discussions, and offer counsel to their commanders. Junior officers seek to support their seniors, and make for a

successful mission.   A consummate junior officer will provide advice based upon his/her own wisdom, experience, and perceptions.

Questions posed to the participating subjects were created by the researchers, and then reviewed by faculty advisors for conciseness and impartiality to present minimal bias. In addition, the questions were discussed with resident experts of the Naval Postgraduate School (NPS) faculty for relevance and subsequent applicability for statistical analysis.

1.   Interviews with Senior Leadership

Some of the senior officers who were solicited to participate were responsive to our invitation, while others did not respond. Some civilian DoD members expressed interest in participating in the interview, however were not able to, due to competing schedules and priorities.

The preparatory steps for reaching out to the senior DoD leadership for the interviews were challenging. We pondered: how best to approach senior management of the Navy? While the researchers desired to make 100 percent contact with each senior officer to determine whether they would be available for interviews, the potentials for roadblocks, misdirected and lost communication were a constant challenge. Some seniors required the questions be vetted through aides, while others responded directly. By virtue of the seniors' busy schedules and positions, we sent just one reminder for our invitation to participate.

Another question deliberated at length: was this interview to be personality or position driven? Some

officers may have a perception of social networking, which they carry to their assignments. Regardless of their position of responsibility, they base their style of command upon their opinions and perceptions. Other officers may see the position of responsibility driving the requirements of social connectivity, regardless of their private opinions on the matter.

We strived to show due deference to the senior leadership. Initially, we did not want to use the same automated survey mechanism for soliciting/collecting answers as we planned to do with the junior officers. We were concerned that the web-based survey system may be seen as pedestrian, and thus not demonstrate respect due a senior officer. Our original vision of the interview was to initially make contact with each senior via e-mail, then as a follow up process, forward an interview letter, which would hopefully encourage thoughtful, candid answers. We requested responses to be returned to us via e-mail as well, in order to have written record of the responses. This would provide a ready reference for our research. Complications with some respondents ensued, in which misunderstand occurred as whether we were to make contact with the senior members via telephone, video conference, or postal mail for receiving the responses.

In hindsight, the automated survey mechanism would have been preferable to the e-mail method for the interviews, since:
- The survey would provides a simple, intuitive mechanism for reaching out to the senior leadership using the Internet via e-mail for

initial contact, and a web browser for responses. Such an interface would be familiar with virtually the entire DoD workforce.

- Online survey collection provides a mechanism for reaching out to leadership stationed overseas, where postal mail can be slow and unreliable.

- Online surveys provide a logical, modern medium for responses, consistent with this research project's subject matter of electronic social networks.

- A flexible combination of Likert Scale responses, short-essay, and multiple answers from lists are available for online surveys.

- Both anonymous and logged participation in surveys are an option.

- Collected responses can be quickly tallied and analyzed.

Response collection for senior officers was not straightforward. Some respondents sent their replies in e-mail, as was originally requested, while others requested in-person/video teleconference meetings. At first, we were surprised by the request for more personal response methods, however it afforded an opportunity for a natural flow of questions, answers, and follow-up questions. In addition, our original interview "script" could be put aside when comments from the seniors flowed in a direction not originally expected during the process of creating interview questions. In other words, the interview tapped in to a flow of conversation that was a more natural exchange of ideas than could be done via traditional e-mail or postal mail.

The request made by some seniors for a more personal response and exchange of ideas may have also been intended

to underscore the sensitivity of the subject matter, and a concern about providing responses that may be inconsistent with published Navy or DoD policy.

Interesting insights from interview process:

- Seniors seem very interested in what is developing with social networking research and its applicability to Navy operations.

- A diversity of opinion is present on what constitutes "social networking" e.g., Twitter. But is this a surprise, as it likely represents the diversity of opinion in the general U.S. population?

- The traditional layers of staffing between seniors and "the rest of us" did not present a burden for the interviews. In contrast, for those seniors who chose to participate, they responded to our invitation directly. Some seniors (or their aides) requested clarification on the nature of our research. This assisted them in scheduling the subsequent interviews.

- 7 out of 25 seniors who were invited to participate did so (28 percent response rate).

- The senior officers who participated in the interview responded fairly quickly to our solicitation for their participation.

2.   Survey of Junior Officers

The data collection process for the junior officers was remarkably straightforward, as the questions, which had been vetted by the research advisors, were simply loaded in to an automated web-based survey system. Respondents could log in and respond to the survey from an Internet connection at their home, work, or public access point. The survey management software produced reports with the tallies for respondents' answers to each question, and a summary of the

number of respondents participating in the survey. We received a participation rate of 39 out of 70 (56 percent).

Once the time period for gathering the survey data was closed, a trivial process ensued to export the data to a spreadsheet and statistical data modeling software for analysis.

C. OBSERVATIONS

1. The Survey Instrument Versus the Interview

Interviews seemed more appropriate for senior officers when first planning the research; however, the exchange of e-mails (several per officer) became a bit of a chore. A simple electronic spreadsheet was required to track the status of response for each solicited officer, from initial contact through completed interview process. This tracking method incurred some administrative overhead. Some demographic information that we did not request from senior officers may have proven helpful, too. This would include present and previous designator, prior enlisted service, and self-assessed computer skill level. Finally, an electronic survey would have been easier to administer than the interviews. Perhaps we would have received more participation if the interview had been electronic? Or less?

We realized we would be competing for the senior officers' time, and had to navigate through potential obstacles, including busy schedules and correspondence exchange via postal mail for some warzone participants.

Surveys were fairly straightforward, but failed to collect demographic information on the population, due to

our survey design. We should have requested demographic data, to include age, gender, present designator, past designator, prior enlisted service, and their self-assessed computer skill level.

In addition to the standard thesis topic vetting process of informing our academic chain of command, we were required to have our research vetted via the NPS Institutional Review Board, since we would be contacting people for conducting our research.

2.   Selection of Groups for Surveys and Interviews

As a courtesy to the Centers of Excellence (COE) for both the Information Professional and Human Resource communities, both centers' directors were informed of our research, and we received permission to conduct our survey of junior officers from both communities at NPS.

For selection of senior officers, we selected flag officers to interview from the Information Professional and Human Resource Communities, as well as more senior Navy and DoD leadership. Our Principal Investigator, secondary reader, and centers of excellence leadership provided counsel for names of senior leaders to consider contacting. All contacts were made though our Principal Investigator.

We were sensitive about our research being perceived as an intrusion to both the senior and junior officers. Therefore we minimized the number and frequency of times when we contacted both groups for participation.

D.   FOLLOW-UP PROCEDURES, EXPECTATIONS, AND CHALLENGES

Senior Officers

We provided a one-time solicitation, which included a cover letter and the interview package. Prompt "thank-you" letters were e-mailed from our senior research advisor to each respondent upon receipt of their completed interview package. Their response package included their answers to our questions, as well as a signed *informed consent* letter. This letter, an Institutional Review Board requirement, outlines the research purpose, risks, benefits, compensation, and privacy information. Participants could optionally agree to be mentioned as a research participant, and/or be quoted by name or title only.

Digital Signatures presented a unique challenge:

- "Signature" as applied to electronically delivered documents is ambiguous. Common methods for electronic certification of integrity include digital signatures from either Adobe Acrobat or DoD Common Access Cards (CAC), a document scanned containing a pen-and-ink signature, or a simple "/s/" notation typed within a document. The convenience, availability, and degree of trustworthiness for both sender and receiver play a role in determining which certification method shall be employed, if any.

- We could not assume that senior officer had convenient access to Adobe Acrobat, much less were familiar with leveraging its digital signature feature with their completed documents.

- We were reluctant to request senior officers to employ CAC digital signatures on their completed documents, as we could not assume they were using computers with CAC readers.

- A pen-and-ink solution, hardly "high-tech", was used by several respondents. It is not as convenient a solution as compared with someone who

is facile with CAC signatures, and the steps required in order to scan and forward the image of scanned documents may be inconvenient in some office settings.

- The symbols "/s/", ubiquitous throughout the Navy, is commonly affixed upon documents ranging from travel claim forms to leave requests. Several respondents employed this signature method as well. Sadly, this very convenient signature method offers no certification of integrity, as these symbols can be typed by anyone.

We expected senior officers to have some reservations about the *informed consent* letter, as they may have concerns that their comments could be taken out of context. Thus, even with a signed informed consent in which we requested explicit permission to quote provided comments with or without attribution, we painstakingly provided assurance that we would seek additional, explicit permission from them for each quotation we desired to attribute, including the context of the desired discussion.

One senior officer requested we participate in a video teleconference. We were delighted to partake in this opportunity, as it afforded us the chance to have a true interview, whereby, the flow and direction of the discussion could proceed naturally, with follow-up questions as necessary. Of course, the original script of questions was forwarded in advance to prepare the officer for the nature of questions we planned to ask.

Junior Officers

We expected at least 25 percent of the invited junior officers to participate in our survey, as a professional courtesy. It is common for NPS students to solicit each other's participation in research. Furthermore, we estimated

the junior officers, on average, to be supportive of electronic social networks in general as they become proficient using electronic group productivity tools while attending NPS, and see firsthand the advantages for electronic workflow.

We expected some officers to be more sensitive to operation security (OPSEC) as compared with their classmates, due to their background and training. Those officers would likely express corresponding concerns applicable to electronic social networking on their surveys.

The survey was presented without specific details of a hypothetical electronic social networking system for the officers to consider. We expected the survey respondents would assume that the same safeguards for electronic social networking systems would leverage the same security controls and defense as existing NIPRNET, SIPRNET and SCINET services.

E.   ONWARD WITH THE SURVEY

We were motivated to test our hypothesis on the Navy leadership's perception of social networking value for operations. Our research required us to gather data from relevant sources: both current and future leadership. The necessary processes for organizing the surveys and interviews was time consuming, yet important to get completed correctly. We realized that in order to reach the current senior leadership we would need to coordinate with various aides, or perhaps battle unwieldy e-mail systems to make contact with our intended research subjects.

Similarly, we were sympathetic towards fellow students at Naval Postgraduate School who were busy with other school assignments and preparations for the upcoming winter break. We were gratified to receive the participation of both senior and junior officers who availed themselves for our research.

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IV. PERCEPTIONS OF SOCIAL NETWORKS

Networking is what links people with similar interests (Liebowitz, 2007). While the definition is simple enough, mutual understanding of this and related terms by researchers and subjects alike is essential. Mutual understanding leads to clarity of communication about perceptions. Perceptions can be described and recorded for analysis, research, and understanding. This may lead to additional research into perceptions concerning social network applicability towards military operations.

In this study the authors sought to uncover the perceptions of both the most senior and more junior of our officer corps. In doing so, some generational gaps and some unexpected trends surfaced.

Data in this research is generally either nominal, meaning it can be grouped into discrete categories, or ordinal that implies it can be ranked numerically, such as a Likert scale.

An isolated analysis of each group is first presented, because the data was collected by separate (but related) research instruments. An analysis comparing and contrasting these trends between senior and junior naval officers is then presented.

A.   PERCEPTIONS OF SENIOR LEADERSHIP

Senior leadership expressed a variety of opinions concerning the applicability of social networks towards

operations. The authors interviewed the seniors about their perceptions of social networking, including both traditional and electronic domains.

Through an interview mechanism (refer to Chapter III), senior officers were asked about the variety of social networks, both electronic and traditional, which they participated in. The authors provided examples for their reference (i.e., Wardroom, Officers Club, Facebook, LinkedIn, etc.). Of interest to the study was how engaged the seniors were with all social networks. This provides context for examining their perceptions.

Note: when this question was asked, several services were provided as examples, including Navy Knowledge Online (NKO). The seniors were not asked which features of NKO were used, such as chat, forum discussions, or possibly non social-networking features such as General Military Training.

1. Flag Officers and Traditional Social Networks

Seniors were asked about their experience with traditional social networks. The Armed Forces Communications and Electronics Association (ACFEA) was the most popular indicated, followed by the U.S. Naval Institute (USNI). Some officers had zero traditional social networks listed, while others indicated as many as five. The average time spent per month using traditional networks network was 8.5 hours, with a median of eight.

Overlooking Traditional Navy Social Venues

The interviewed officers did not mention Wardrooms, and only one respondent mentioned Officer Clubs. This was a surprise in this research, as both have been traditional meeting venues for Navy officers. Is this a growing trend? Perhaps these respondents simply did not consider traditional Navy social outlets as "networking," as they are so integrated with the Navy culture and, thus, taken for granted? By discounting the social network venues, the respondents may be overlooking the value provided at such opportunities. Opportunities to exchange knowledge, examine solutions to problems, and stimulate professional growth may be lost. Navy members are advised early in their careers of the importance of teamwork, and logically social networks provide value to a team's mission.

Ad Hoc Networking

Aside from the social networks specifically mentioned, additional avenues are routinely available for networking among colleagues. For example, opportunities exist for informal lunch visits, telephone conversations, and ad hoc passageway chats. These officers may have a history together, like former Naval Academy classmates for instance, or perhaps they have served together aboard the same ship. Thus, trust likely exists between them. While those seniors interviewed did not mention passageway chats, and so forth, it is a foregone conclusion they do so on a regular basis.

2.   Flag Officers and Electronic Social Networks

Seniors were asked about their experience with electronic social networks. Facebook was the most popular

social medium indicated, followed by Twitter. Some officers did not list any electronic networks, while some listed as many as seven. The range of time spent each month ranged from zero to 60 hours per month. The average time spent per month on electronic social networks was 24, with a median of 12.

Electronic Networking is Popular

Among the senior officers interviewed, electronic social networking participation averaged 24 hours monthly, which is approximately three times greater than with traditional networks (only 8.5 hours). The respondents were not specifically asked for details on how much of the social networking was personal or business-related. Some officers did provide amplifying information for these details, however. Is the greater use of electronic connectivity as compared with the traditional mode a growing trend, or were these results atypical? Was the disparity of mode usage type a function of convenience, whereby laptop computers are all that's necessary for Facebook, contrasted with necessary travel to a club's meeting location? Perhaps the relevance of content as discussed in the electronic systems was more salient than traditional venues?

Making Time to Network Electronically

As for participation in electronic social networks, several participants indicated that although they desired to partake in some kind of electronic networking, they simply did not have time to do so. RADM M. Brown remarked, "Would like to spend more [time], but can't at work due to restrictions."

Busy work schedules and a desire to use familiar, established organization procedures are understandable arguments to not introduce a substantial change. Leadership desires to maximize productivity while minimizing disruption within the organization. Thus, benefits and risks must be considered.

The addition of yet another communication method to the immediate organization, entire enterprise, or perhaps yet larger public audience must be done with due care and with sufficient frequency so that the other network participants receive expected communications. The new communication method must be used to its full potential in order to provide incentives for switching from existing communication methods. Senior officers who rarely post on Facebook, for example, may find their audience smaller than the officer who posts regularly.

Some officers decided to cease their electronic networking after changing duty stations, as they were not the commander (or officer in charge), and were thus concerned that their comments could be construed official command views.

Electronic Networks and Policy

Note that this research was conducted while DoD policy was not yet settled for social network applicability for unclassified networks. Within this context, is it possible for leaders to be participating in social networks, and act as individuals rather than as in their position of responsibility? What about Deputy Commanders and Executive

Officers? Can those people use Facebook without risking having their comments perceived as in conflict with official command policy?

One final observation from the senior officers concerns a direct benefit for electronic network participation. By engaging in the network, VADM N. Brown notes an increase in efficiency by a significant drop in the incoming messages (as much as 50 percent) for some of her tasks, and that it "made it much easier for me to manage the critical information I needed."

3. Additional Observations from Flag Officers

Networking When Not Working

Some participants use social networking that is not specifically tailored for operations, yet arguably could help them balance their lives through social connection. For example, during non-working hours, a participant might spend time chatting with associates about a hobby, such as photography or crafts work. The departure from routine work matters is always a welcomed healthy mental break. In addition, perhaps the participants might share their hobby interests with work colleagues, thus developing common interests that would help develop professional trust and friendships.

For example, RADM J. Hamby spends 2-3 hours each month networking with traditional professional organizations where she maintains professional contacts, and attends panel discussions. In addition, she devotes 32-36 hours monthly with personal development web sites (such as education and informal community sites) and hobby web sites (including a

knitting e-community). These online social networking sites provide her opportunities to exchange advice, and stimulate community identity.

Transmitting and Receiving Information

Interview responses indicated an interesting variance in how much seniors "transmitted" versus how much they "received" on social networks. This ratio ranged from none (no network participation), to 50/50 (equal measure), to 70/30 (more transmitting than receiving). VADM J. Fowler indicated that although he did not use electronic social networks, his aides did, in order to meet mission requirements. ADM Stavridis emphasized that when transmitting, he personally handled transmissions, in lieu of his aides, especially in response to matters originally addressed to him, as he wanted to underscore the integrity of the message sent, and therefore its value. He adds, "I personally manage my own electronic social networks 95 percent of the time."

The degree to which someone is more of a transmitter or receiver on social networks may be influenced by the type of job they hold. Would senior leadership primarily be concerned with transmitting more than receiving? This seems intuitive, as the more senior one becomes, with added responsibility, it seems one is more likely to have less time for engaging social networks. Our data shows no such trend, although a larger sample group for future analysis is indicated. Seniors who recognize social networking to be mission critical will necessarily change their schedules to accommodate networking.

B.   PERCEPTIONS OF OPERATORS

These data were taken from 39 Naval Postgraduate students, from a population of 73 naval officers comprising the Information Professional and Human Resources communities on campus. The target participants were from the junior officer ranks, therefore ranks ranged from Ensign (O-1) to Lieutenant Commander (O-4). The subjects were contacted via e-mail, where an online survey link was presented to them with brief instructions and an introduction to the study's intention. Those willing to partake in the study were directed to a short 15-question survey that asked them about their habits, usage, and perceptions of social networks.

Like the senior officer interviews, the authors bifurcated the questions to cover perceptions on both *traditional* and *electronic* social networks. Participation by these junior officers was strictly voluntary; therefore at times data collection was incomplete or even erroneous was students misunderstood or opted out of the survey. Some cleansing of the data was necessary to remove errors and unanswered questions to prevent skewing of the results.

1.   Junior Officer Traditional Social Networking Analysis

Each officer was asked a short list of questions to gauge their level of participation in each type of social network, face-to-face and computer-mediated. Question #1 is omitted here because it dealt only with consent to the survey, and had no bearing on the survey itself.

Question #2: Are you currently or have you been a member of any of these traditional social networks (Face-to-Face)? You may select more than one answer.

This question polls the population for what face-to-face social networks they already participate in to determine the range of responses, see Figure 2. The options provided were purposefully targeted for naval officers and covered anything from work related (Wardroom) to community service oriented (Lion's Club Int'l, Kiwanis) social networks. The majority of respondents focused their time in work and Navy community types of networks.
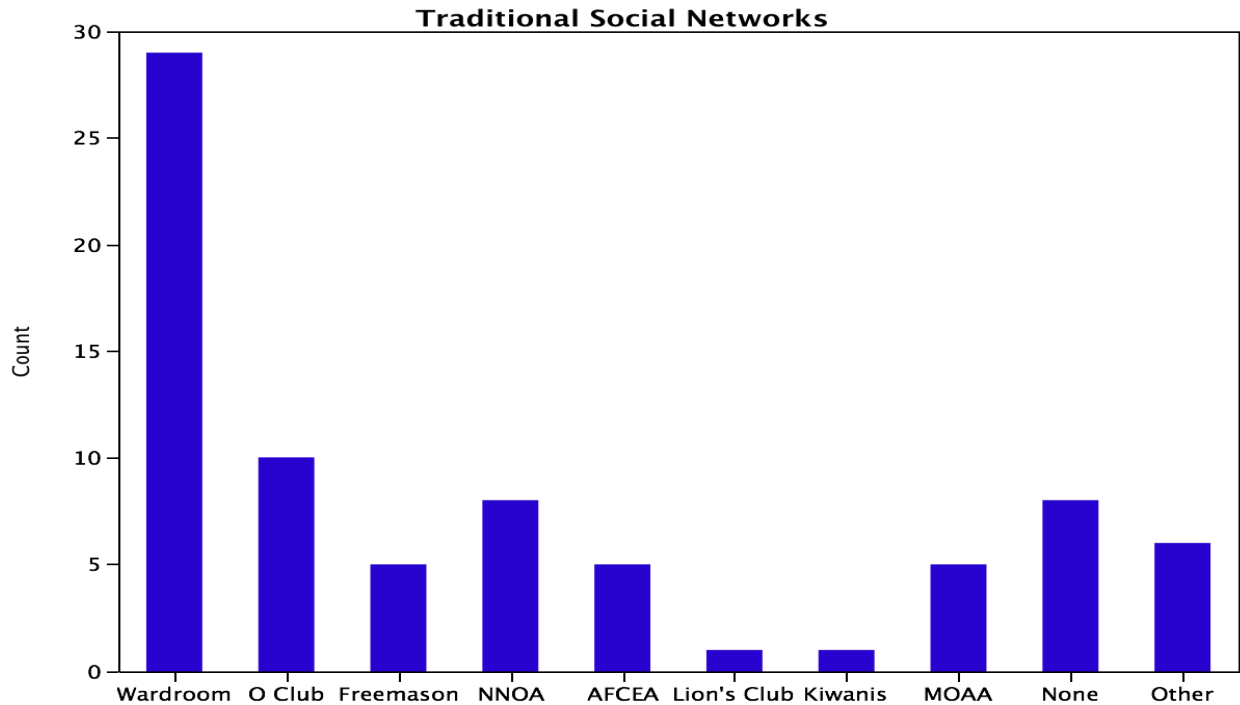
Figure 2. Shows the distribution of traditional (face-to-face) SN participation across junior officers surveyed.

Question #3: Per month, approximately how much time do you spend participating in traditional social networking activities?

Knowing which networks people participate in is only partially informative. To determine whether officers find these networks beneficial, the authors look at one metric in which all professional officers place value: free time. Of interest is where the majority of respondents fall when it comes to spending time enriching their careers, social lives, or families outside of regular business hours (see Figure 3).
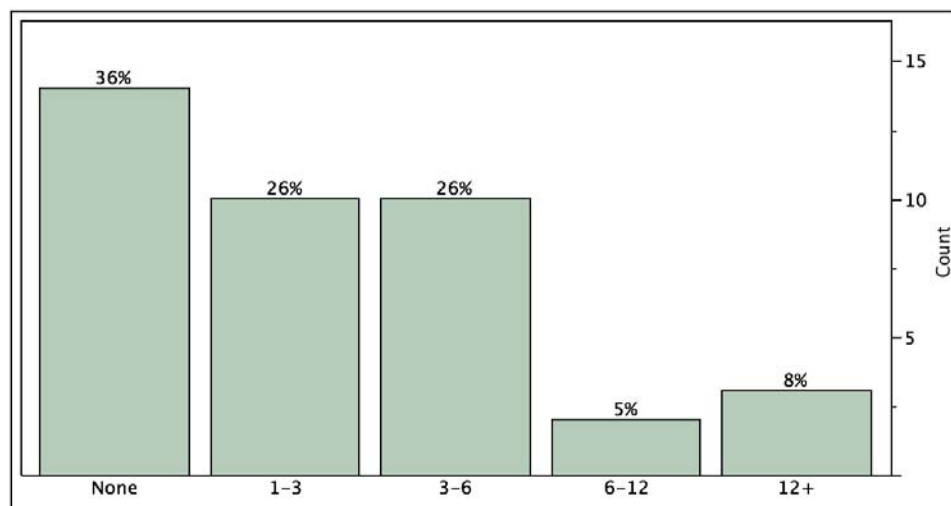
Figure 3.   Shows time spent engaging in traditional social networking in hours.

What we see in Figure 3 is that over 50 percent of junior officers (20 people) say they spend between 1–6 hours a month engaging in social networks face-to-face. It was also telling that 36 percent of this population claimed they spent no time engaging in traditional social networks, combined that equates to nearly 90 percent of those polled spending 6 hours or less each month.

Question #4: Of time spent using traditional social networks, how much of it pertains to business/work? Question #5: How much of it pertains to recreation?

Figure 4 illustrates the motive for traditional social networking activities, whether for career or personal reasons. The shaded region represents the same group of individuals. Of note, the same respondents who denied that time spent in face-to-face networks (left) is work related mostly did it for social reasons, (right).
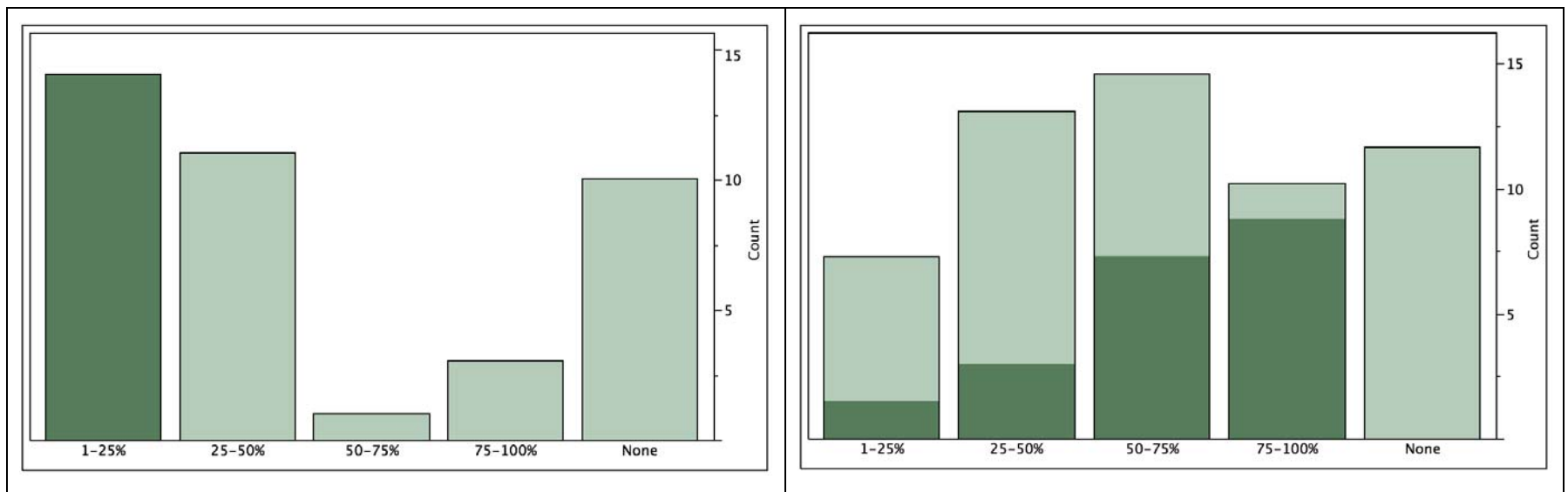
Figure 4.   Time spent on ESNs focused on work (left) and personal pursuits (right)

Question #6: You feel time spent on traditional social networking reaps substantial career benefits.

To infer the most common reason junior officers participate in face-to-face social networks, questions 6 and 7 were devised. Its purpose is to determine if motivation involves more than time spent each month. Figure 5 indicates that 41 percent of junior officers agree that participating in traditional social networks betters their careers. But what is the nature of their relationship with those they network with? To answer this question, the authors posited that social networking for work would build professional relationships with people, shown in Figure 6.
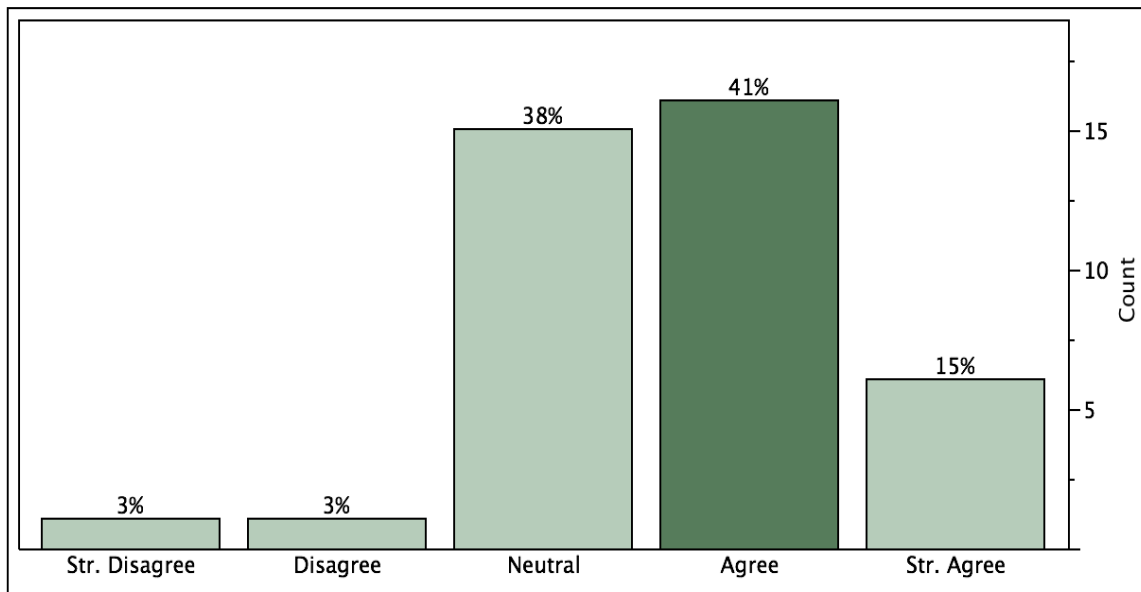
Figure 5.   Shows percentage of junior officers who feel
            traditional SNs offer career benefits.

Question #7: You build professional relationships through traditional social networks.
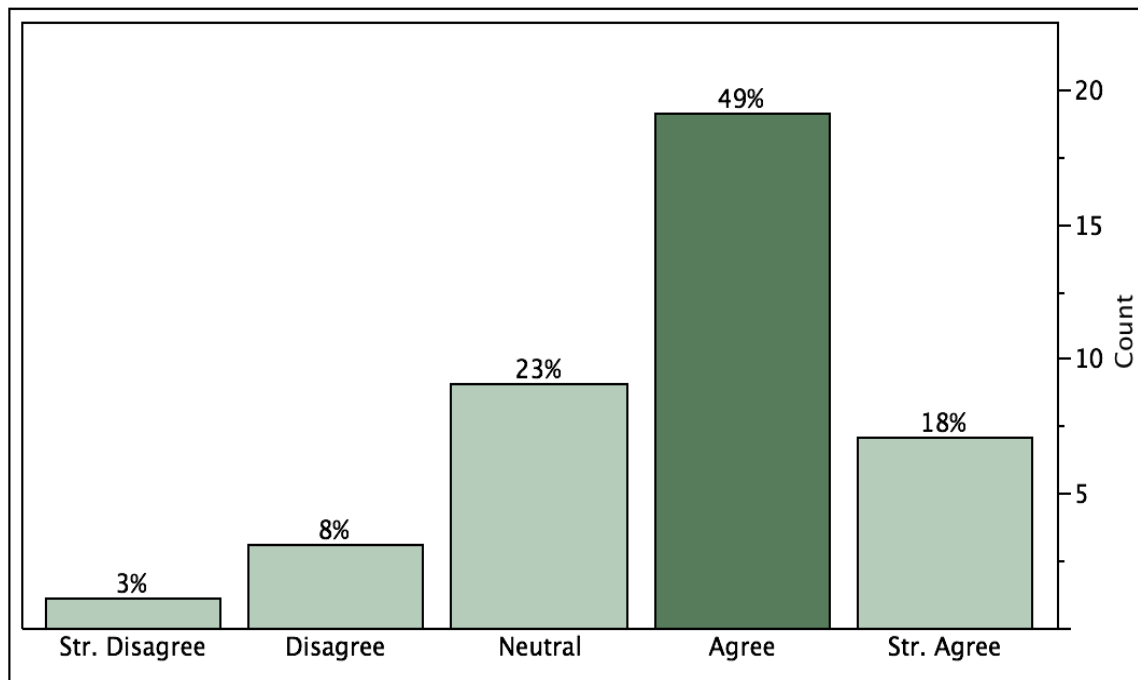
Figure 6. Shows percentage of junior officers who build professional relationships through traditional SNs.

This chart (Figure 6) shows that half of the officers felt face-to-face networks are about building professional relationships with one another. Only 11 percent felt they were participating for reasons other than professional.

Question #8: You would lose touch with valuable colleagues if you did not spend time in traditional networks.

An interesting question about face-to-face social networking was whether time spent attending meetings, social gatherings, or parties was so participants could meet new people or maintain their current network of colleagues. Given the unique lifestyle of military service members and

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high turn over rate of personnel at duty stations, they are equally likely. Figure 7 elicits whether maintaining professional relationships is accomplished in an informal social setting.
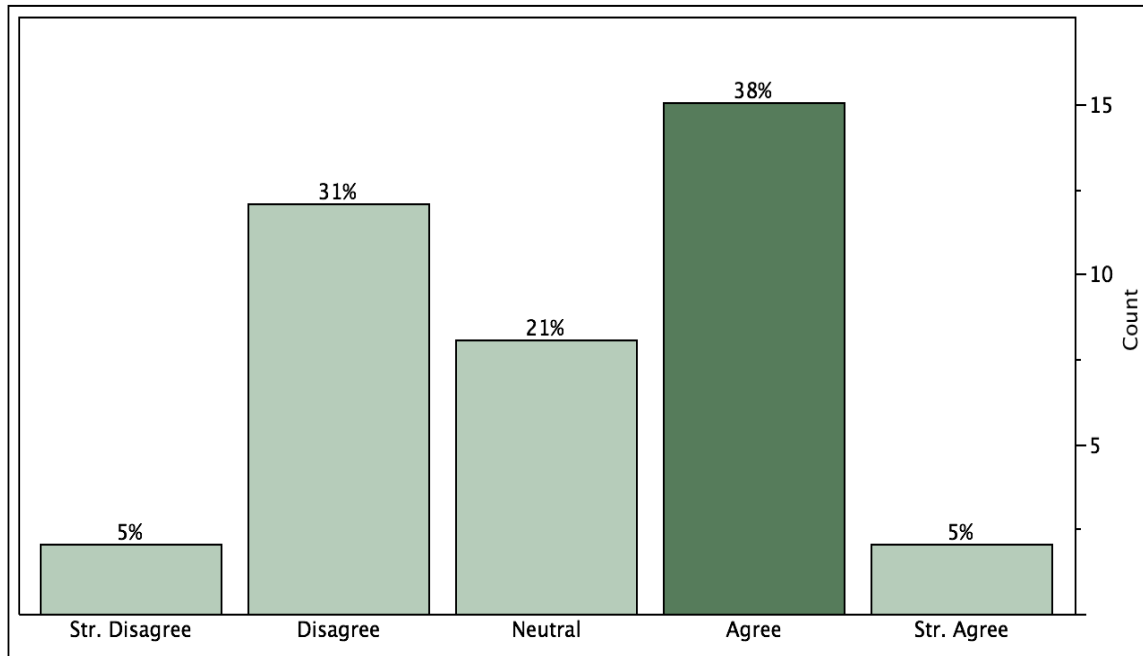
Figure 7. Shows the breakdown of junior officers who use
face-to-face networks to maintain contact with
colleagues.

The results were somewhat mixed, nearly an equal number of respondents claimed that regular face time did or did not maintain their network of colleagues. Although slightly more responded in the affirmative, the distribution appears fairly normal, with few officers feeling strongly about it one way or another. Perhaps those who disagreed felt there were other ways to maintain professional contacts than traditional means.

2. Junior Officer Electronic Social Networking Analysis

The second portion of the survey dealt exclusively with electronic social networks. Six questions, similar to the section on traditional networks, captured utilization of computer-mediated social network tools, both military and public domains. It is important to note that the electronic tools used in the poll represented a sample of what is available; it was not meant to be comprehensive.

Question #9: Are you currently or have you been a member of any of these electronic networks? You may select more than one answer.

Examining the data in Figure 8, one can deduce that respondents are split equally between a DoD networking tool and a commercial one. Although there are several other options that accrued counts, the majority of respondents participate in both Facebook and NKO/DKO. Note: when this question was asked, several services were provided as examples, including Navy Knowledge Online (NKO). The authors did not specifically ask which features of NKO the respondents were referring to such as chat, forum discussions, or possibly non social-networking features such as General Military Training.

Electronic Social Networks
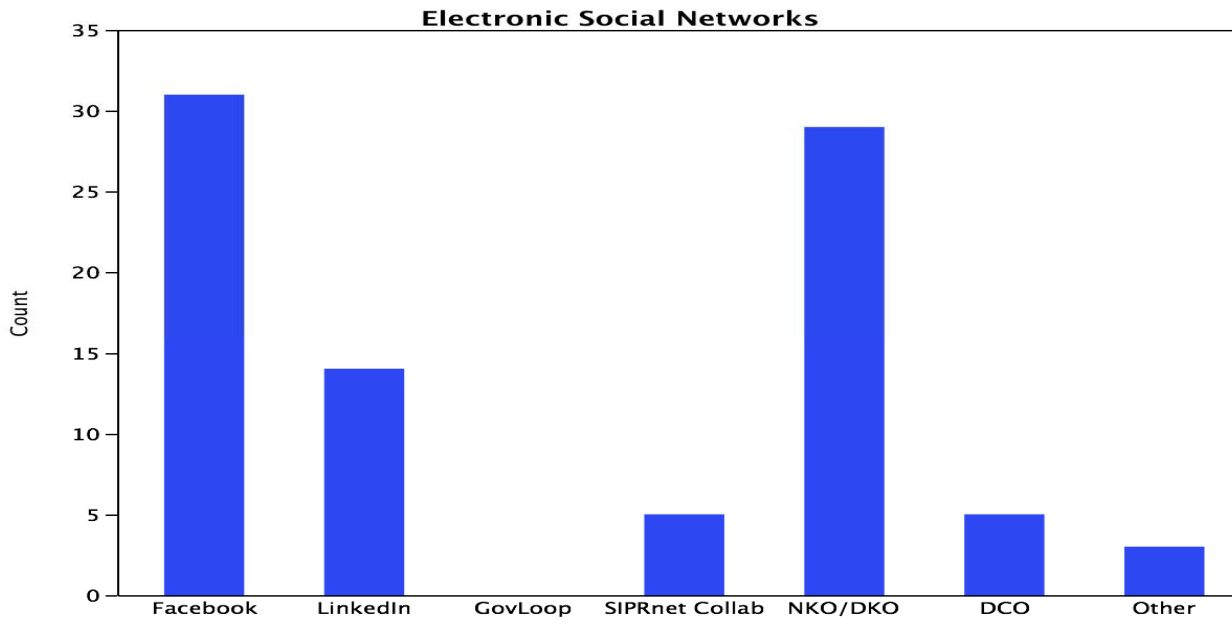
Figure 8.   Shows the distribution of electronic SN
participation across junior officers surveyed.

**Question #10: Per week, how much time do you spend
using online social networks?**

Figure 8 shows how much time junior officers are
spending on electronic social networks. This was important
to accurately compare the time commitment with that of
traditional social networks to determine if officers used
one exclusively, a combination of the two, or none at all.

It was also telling to use these numbers to compare
against the senior officers data. Although the populations
were small, it was possible to draw some trending data that
indicated at least how officers of different ranks were
using electronic social media for work and personal use.
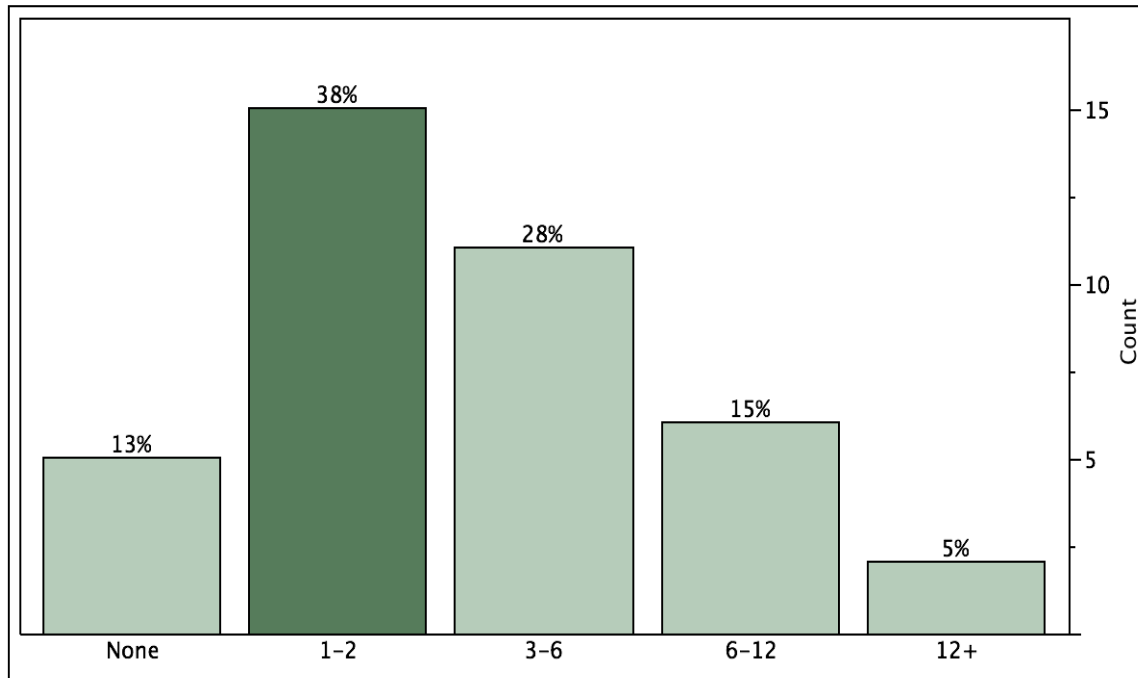
Figure 9.   Shows the utilization of electronic SNs in hours
per week.   Percentages are out of total JO population.

As you can see in Figure 9, the vast majority of naval
officers spend just 1-2 hours using electronic social
networks per week.   Of note, the hours spent on these online
tools dropped precipitously as the hours increased.   It was
also relevant that as time spent on social network tools
doubled, utilization dropped approximately 10 percent for
each successive interval.

Question #11: Of the time spent using online social networking, how much of it pertains to business/work? Question #12: How much of it pertains to recreation?

Figure 10, designed with Questions #4 and #5 in mind, divides the time spent using online social networking tools into either business or personal use. Of the 39 respondents, 18 (46 percent) claimed to use electronic social networking for recreational purposes only. Overall, nearly 80 percent of the officers felt personal use constituted more than 50 percent of their time using online networks. Looking at the results on the business side, most officers spent less than 25 percent of their time using electronic networks for work.

Figure 10.   Time Spent Online: Business (left) and recreation (right)
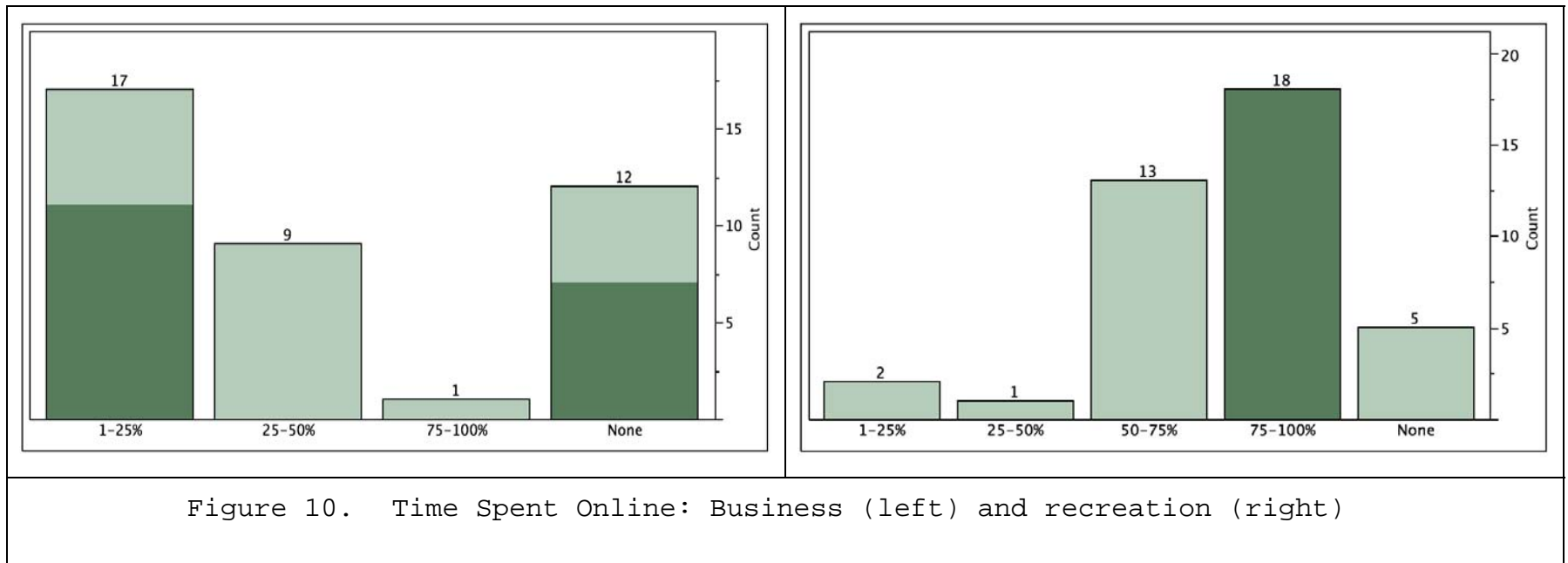
Question #13: If online social networking were integrated into the workplace, it would significantly increase you ability to get things done.

Upon inspection of Figure 11, a trend is clearly observed from left to right.   The majority of officers (33 percent) agreed that introducing social networking into the workplace would improve productivity.
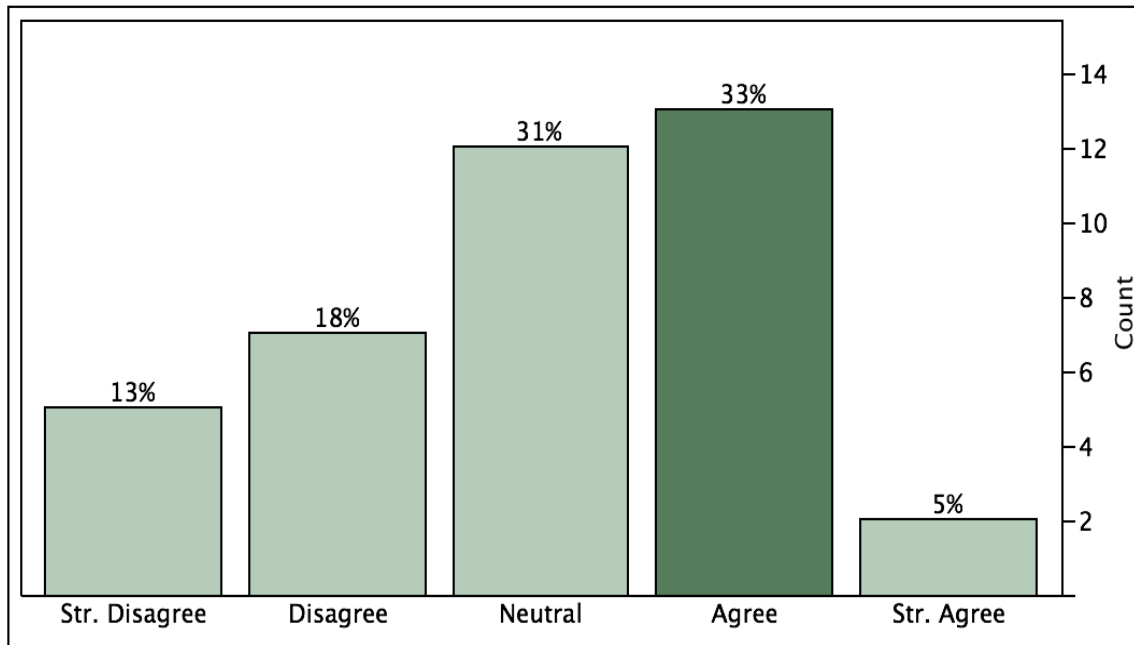
Figure 11.   Shows the perceived increase in workplace productivity
if electronic SN tools were introduced.

It was interesting to compare Figure 11 with the next
question, and its corresponding Figure 12.   The data were
supposed to be mirror images of one another, but instead two
anomalies were observed. Officers who see value in integrating
social networking into the workplace did disagree it could
detriment productivity.   However, fewer respondents (31 percent)
disagreed with integrating social networking to increase
productivity than those who agreed that productivity would
suffer in doing so (36 percent).   This perhaps implies a
resistance to change or even some risk aversion from the junior
officers, who are in fact the managers who this directly
affects.   From a different perspective, the data might have been
skewed toward higher risk acceptance.

Question #14: Online social networking is a detriment to productivity in the workplace, and causes headaches for management.

This data were closely related to the previous question, almost antithetically. The difference being, the focus was on risk rather than opportunity. In Figure 12, the same group of officers remained consistent with their response in Question #13, the exact same 33 percent of respondents thought social networks was a risk worth taking.
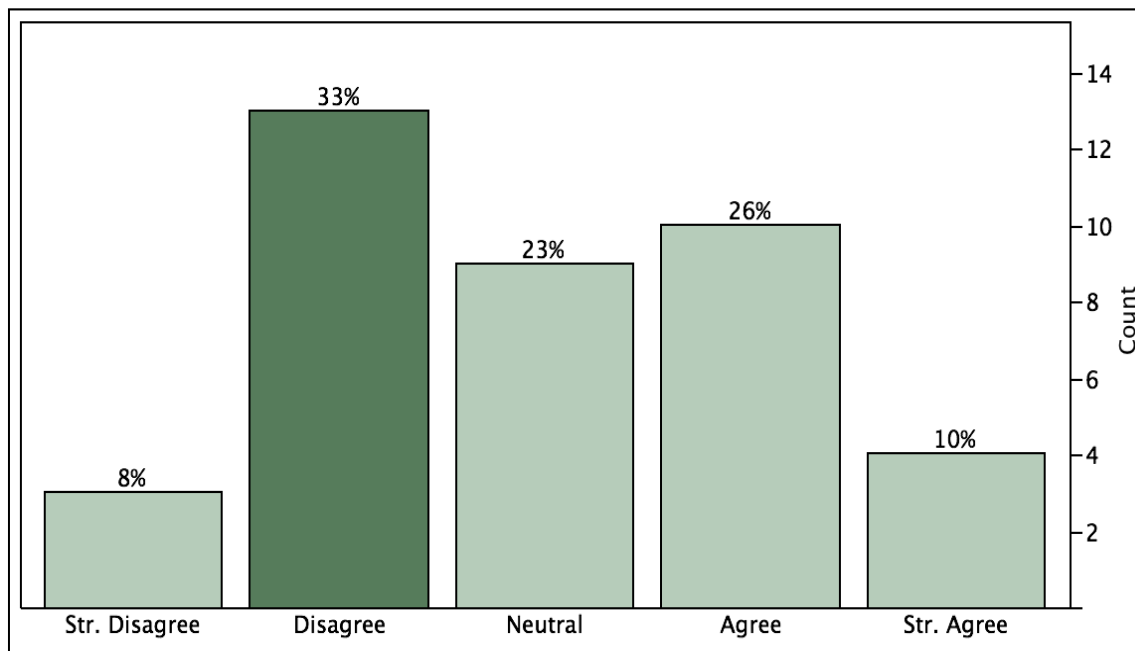
Figure 12.   Represents the expected risk to productivity if electronic SNs are integrated into the workplace.

C.   COMPREHENSIVE DATA ANALYSIS

In this section, the responses of both senior and junior officers are analyzed for similarities and differences. The identification where both groups agreed indicated possible trends, whereas if they disagreed it may represent areas needing attention and further development. For instance, the flags agree with junior officers that OPSEC concerns and INFOSEC

controls are not in place to effectively use social networks within the firewall at present. Conversely, there is no corollary between seniors and juniors on how best to train the workforce on proper use of social networks as a means of communication.

One of the most difficult issues to overcome during this research was defining a language that was understood by participants. Several times the authors found that terms used in the surveys and interviews had different meaning to different people. Clarifying the intended usage and establishing a language that all readers agreed upon often required concrete examples to demonstrate its meaning. An example of this is when respondents were asked whether social networking provided value to the warfighter. Some responded that the value is evident, others that the warfighter receives no direct benefit due to social networking, and last (and most disconcerting) was the number of responses that said they did not know.

Of note, junior officers automatically assume social networking concerns electronic mediums and that senior officers view social networking in a more general way. This indicates the perceptions of each group of officers vary based on factors that are detectable, yet not altogether measurable. With that in mind, the authors delve into the perceptions of these officers by medium and then by topic.

1. Electronic Social Networks

Electronic Social Networks are quite popular. So much so that the U.S. Department of Defense released a memorandum (DTM-09-026 2010) officially supporting their use by Department members to include social networking, e-mail, YouTube, and so forth on unclassified systems, even for personal use (U.S. Deputy Secretary of Defense, 2010.) Naturally, users must follow

published regulations and exercise good judgment so as to not let their activities interfere with official business. The most popular social tools (Facebook, Twitter, LinkedIn, etc.) will continue to evolve to meet the end-users' ceaseless expectations.

The overall distribution of electronic social networks is illustrated in Figure 13; the most frequent response depicting electronic network use is between 2 and 3.
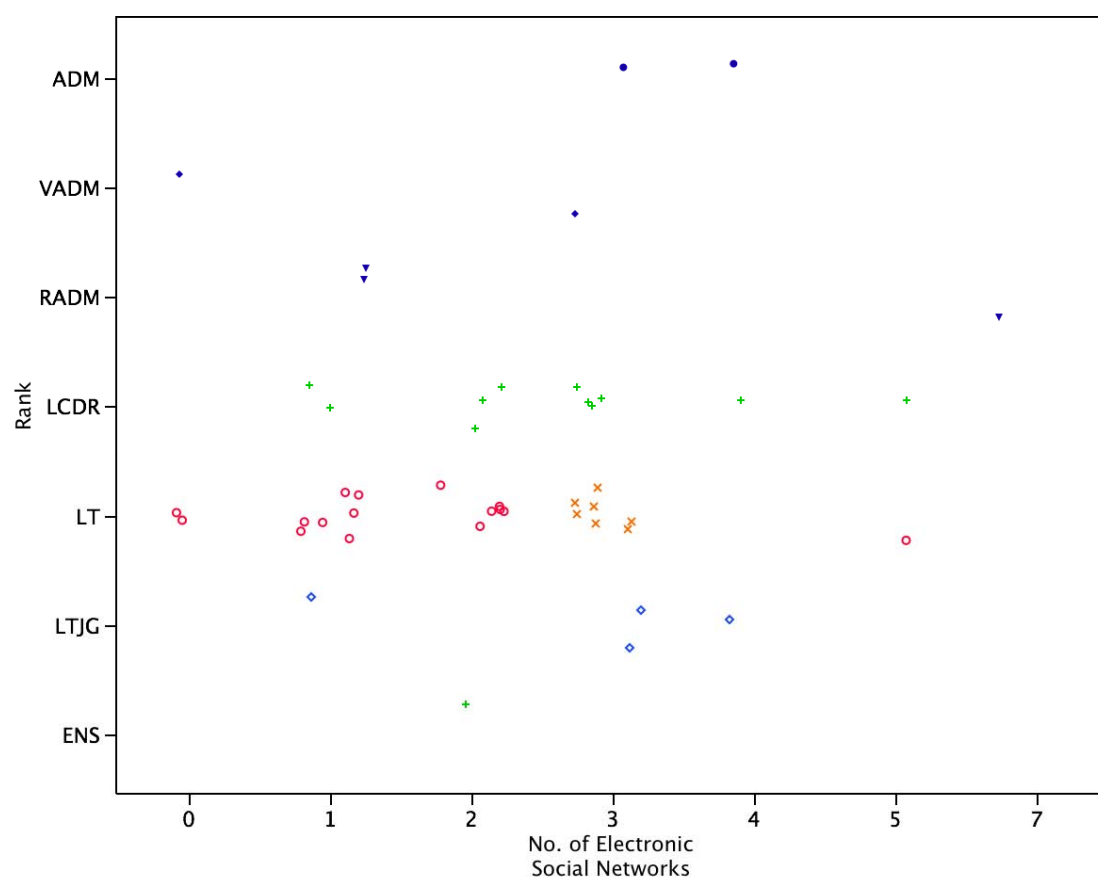
Figure 13.   This scatter plot shows the raw data for electronic social network usage by rank, from O-1 to O-10. It indicates how many SNs each officer participates in.

The power and potential of electronic social networks is far beyond what typical tweeting teenagers contemplate when engaging their friends online for lunch dates. For example, these tools facilitate coordination of diverse groups: "first

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responders" and support teams in the event of disasters, thus saving time, money, and lives. The DoD can either lead in implementing the best of emerging tools and techniques, or leave it for others to do, whereby DoD will become a follower of the new paradigm, not a leader.

> These tools connect us regardless of location and can be critical during and after a catastrophic event. Electronic social networks represent a new world that we must explore and exploit or we risk becoming irrelevant. If we chose not to be part of the conversation it will go on without us.
>
> —VADM N. Brown

For example, in the 12 January 2010 earthquake, the DoD deployed its new Transnational Information Sharing Cooperation (TISC) network before it had been fully tested, in order to support the emerging humanitarian crises. TISC's power is in its simplicity of use, and independence from the host nation's communications infrastructure(Pierce, 2010). The 1,700+ TISC users (mostly relief organizations) in Haiti have access to the power of knowledge available by virtue of the diverse network membership. A surveyed junior officer observed, "If the network is large enough, a person can get quick answers to problems, feedback from situations, and contacts for future help."

Another power of electronic networking is the potential of reaching very large audiences, thus facilitating both broadcast as well as reception of information from audience members. Commanders and Officers in Charge desire to keep their commands informed and up to date on emerging conditions. When asked about the value of social networking, one junior officer replied, "If used correctly, online social networking is an easy way to disseminate information, solicit information from co-

workers, and keep everyone in the command up to date." During our research, the authors observed strong support for electronic network integration in the DoD.

> The value function for me is clear: the medium allows me to reach (broadcast) to a much wider audience in a very efficient fashion, and allows me to connect (interact) with individuals and groups that I might not otherwise come into contact with. I am constantly receiving and responding to e-mails that come to me via Facebook from individuals who are interested in or have ideas about my work. While these electronic platforms do not allow for the same depth of exchange — and certainly much can be lost in translation — the advantage of overcoming time and space, age and education via these networks is hugely beneficial.
>
> —ADM Stavridis

Thus far, the electronic social networks benefits for diverse groups and large audiences have been explored. A third benefit would be the speed of connectivity, and for seeking desired information. A junior officer recently opined, "The value of social networks is the ease in which I can quickly find a contact that I may not have communicated with in years but I know that he has the knowledge I need for a particular issue." Obtaining accurate information quickly is a constant challenge for many lines of work, including Department of Defense. An electronic network that allows users to reach out to subject matter experts for consultation, and perhaps also which catalogs previously captured explicit knowledge would make a tremendous asset for military commanders.

> Two attributes of Facebook that traditional networks do not possess: (1) speed of communications and (2) a powerful cross-referencing search engine that runs in the background.
>
> —RADM J. Goodwin

Thus, both junior officers and seniors agree that knowledge and delivery speed are highly desired attributes for such a network.

2.   Face-to-Face (Traditional) Networks

When both junior and senior officers were asked how they would use social networks, the senior officers mentioned traditional social networks, such as professional trade groups, civic organizations, and hobby/craft clubs as instrumental for their professional (and personal) growth. In contrast, junior officers, acknowledged some participation in such organizations, however they did not mention traditional social networks when discussing network applicability to their careers. Figure 14 illustrates the distribution of each respondent's traditional social network usage, grouped by his or her rank. It is telling that far more junior officers claimed no participation in traditional networks than did senior officers.
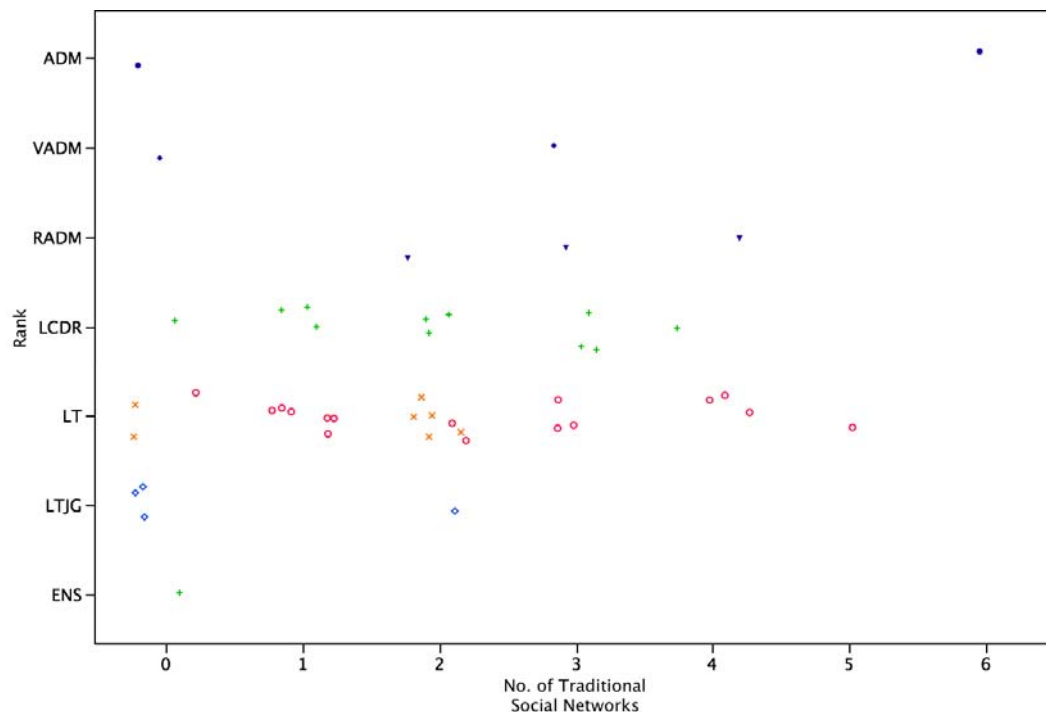
Figure 14.   This scatter plot shows the raw data for traditional social network usage by rank, from O-1 to O-10. Each grade is stratified and broken out by color to distinguish them from one another.

The power of traditional social networks should not be underestimated, even in this age of always-on electronic connectivity.

> As a leader, much of my job is to define a vision and mission and a strategy through which to achieve these, and then communicate it relentlessly. I rely heavily on traditional networks to do this, as face-to-face communication is without doubt the most effective communication approach.

> —ADM Stavridis

RADM J. Hamby underscores the trust earned through face-to-face networking would take more time if using an electronic counterpart. Human communication improves when done in person, as visual cues including facial expressions, tone of voice, and body language all play a part in conveying intent from the speaker to the listener. It is the intimacy of face-to-face communication that makes the collaboration work so well:

> Face-to-face is a credibility, comfort and confidence builder. Not all members of teams must meet in a face-to-face fashion, but sufficient key leaders and members must do so in order to provide the familiarity that breeds trust for good movement and compromise as difficult issues are wrangled. Virtual collaboration takes a bit more time to reach that level of trust that allows speed to ensue.

> —RADM J. Hamby

3.   Importance of Trust in Social Networking

Untrustworthy information on a social network is of little value. This is true whether said information is disseminated in the Wardroom or via the Internet in rapid response to a time-critical question. Useful information has to be credible, and thus, so does the network in which the information propagates. The network users need to be credible and the integrity of the

information above suspicion. ADM Stavridis, a proponent of electronic social networking, who has 3,586 Facebook Friends, appreciates the importance of maintaining the level of confidence among network users.

> …I am responsible for "status updates" and certainly for responding to messages that are sent directly to me.   Electronic social media is based on an understanding of authenticity between users; I am committed to maintaining my own "voice" in these forums.

> —ADM Stavridis

The junior officers surveyed did not explicitly mention "trust" in their social network observations; however, there was a common theme of the seeking of help on electronic systems. One officer offered that social networks "connects them to peers who may know the answer to critical questions." This junior officer likely assumed the network he would be using was secured from unauthorized access. Recall that the surveyed officers were given no specifics as to how an electronic social network was configured or operated. They were free to make assumptions on their own. The issue then would be on the trustworthiness of the source human who inserts the information into the electronic network.

Senior officers, as they operate at the strategic "10,000 foot level" as compared with the junior officers "on the deckplate level", are wise about related matters to ensuring the success of a trustworthy social network. RADM J. Hamby observes that Tactics, Techniques and Procedures (TTPs) are essential for structuring the information flow across the social network. With structure comes trust.

> While the information itself may be unstructured, the TTP for sharing information using social networking means is more critical in the operational environment. In this case, the trust is in the proven (through

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experimentation, both formal and informal) and practiced (through exercise and drills) TTP for how, where, when and why information is shared.

—RADM J. Hamby

4.   Joint Capabilities/Operations

The perception of social networks applicability for military operations is the cornerstone research question for this report. Intuitively, traditional social networks have been supporting the naval officer's operational decision-making process since navies first sailed the oceans. Wise officers seek council from those they trust when considering important decisions, so as to minimize errors, gain perspective, and maximize chances for a successful mission.

Electronic social networks can add similar value to the war fighter, according to surveyed junior and senior officers. RADM J. Hamby observes that the integration of several communication mechanisms brings tremendous value to the watch floor:

> Tactical employment of social networking in the midst of operations can be very successful as well. Use of chat and shared blogs delivers a richer situational awareness, especially when combined with a common operating picture developed from fused information sources.

—RADM J. Hamby

A junior officer, who has likely been to sea, suggests that existing functionality of Combined ENTerprise Regional Information eXchange System (CENTRIXS) and Collaboration at Sea (CAS) could be combined with other social networking tools to provide the watch stander an improved situational awareness than is possible with the current set of tools.

I see a role based warfighter. On all domains [from] NIPR [to] JWICS. Imagine going to watch as the TAO or BWC for the staff. You log in to your account next to the person on watch and see everything then see updates to the battle rhythm, changes and deletions. Current status of all units and all contacts needed for the watch. As information is updated it is updated on all accounts. It would provide role based access and user accountability. Commanders could give guidance and direction immediately [and] directly to all watch stations. It would replace chat and reduce time to briefings etc. Combined with CAS and CENTRIXS this would be an invaluable knowledge management tool.

—Navy Junior Officer

Navy leadership is well aware that junior officers (and *their* subordinates) are more adept at using electronic social networking tools than they themselves are. It's a shift of the Navy culture as American Society embraces the new way to stay in touch with friends and colleagues. As VADM J. Fowler points out, below, Navy operations must keep up with the trend of harnessing electronic social networking. The pace of operations is so fast nowadays that the Navy cannot return to the time when the ship's Commanding Officer would pen his signature on a naval message for its release to other commands, as each official communications method for inter-command communications. The Navy's junior personnel are comfortable with this new paradigm.

In the operational world, a decade ago we officers were worried about the "informality" of instant messaging/chat. We wanted CO released formal messages only. We soon learned that chat was valuable in coordinating complex tasks, such as massive TLAM strikes. We also learned that although the senior officers couldn't manage six simultaneous chats on a screen, our young people did just fine. Now I don't think we would operate effectively without this previously "feared" means of communication.

—VADM J. Fowler

5.   Benefit Versus Risk

The benefits of electronic social networks, with respect to combat operations, has been illustrated. How does current and future Navy leadership see risk management for this emerging new technology?   To be viable in the Navy's information domain, social network benefits must be substantial enough to outweigh the risks.   ADM Stavridis argues that this is the case.

> I see huge positive benefits to these forums which far outweigh the costs.   Not only do they allow us to inform and educate audiences far beyond the traditional, they also allow us to lower our organizational barriers and allow other viewpoints, expertise, and ideas to inform our understandings and deliberations.   We are none of us as strong individually as we are together.   Allowing diverse voices — via electronic social networks or any other means — to enter into our dialogue will in the end only lead to stronger outcomes.   It may be uncomfortable at times, but in the end it will achieve optimal results.
>
> —ADM Stavridis

Recall (Chapter IV, Section B) that as for comparison with the junior officers surveyed, 38 percent agreed that if social networking were integrated into the workplace, it would significantly increase the ability to get the assigned tasks completed. This compares with 31 percent disagreeing with that opinion.

Risks are present in any endeavor to make changes to the status quo in combat operations. Too, there are risks associated with *not* making changes. What if the adversary implements changes to *their* TTP to accommodate new paradigms such as electronic social networking, and the U.S. does not? Will the adversary gain an advantage over our own decision cycle? What of technical and administrative security concerns? Information assurance is foremost in concerns when implementing information

technology in today's military, whether in the operation units or supporting activities. The system is hardly of any value if the confidentiality, integrity, and availability (CIA) components of the IA triad are not intact. RADM J. Hamby weighs in on managing these risks, underscoring the need for education of our personnel. Arguably, not just the personnel who sit at the consoles operating the equipment, but to include those who install and manage, those who plan when making software and hardware purchase decisions, and everywhere in between. Security-hardened software, hardware, training, and installation must be part of the implementation plan.

> So, lack of structure for employment of social networking tools is a risk. Additionally, use of social networking sites in the unclassified and non-classified domains presents other risks— threats to OPSEC, information security and mission assurance (by counting on a site that may not be there when you need it). All can be addressed though. The biggest mitigation factor is education of the user so that they understand the dangers and the way their behavior shapes the level of risk to which they expose themselves, their equipment and their mission to the threat.

> —RADM J. Hamby

If the DoD is to implement social networking, as a tool for collaborative communication, to the confidentiality, integrity, and availability of the system must be designed in to the system. Proper TTP Training and enforcement for the operators will ensure consistent language usage to minimize confusion among operators, resulting in clarity of meaning and thus system value.

V. CONCLUSIONS AND FUTURE RESEARCH

A. CONCLUSIONS

Throughout the course of this thesis, the authors explored social networking, and particularly electronic social networking as perceived by both current and future Navy leaders for its applicability to combat operations. Through separate (but related) research instruments, an assessment on trends in perception was conducted. As the authors of this paper are U.S. Navy officers themselves, they had an interest in exploring potential emerging trends, which may benefit the Navy, as well as the DoD.

The authors thus have an interest in supporting research of emerging opportunities for preservation of our tactical, operational, and strategic advantages. Electronic social networking may offer a method of enhancing situational awareness for watch floor operators and analysts whose potential are not met through conventional electronic tools. As pointed out by VADM N. Brown, electronic social networking tools "made it much easier for me to manage the critical information I needed." DoD must continue pursuing opportunities of advantage over adversaries, as they continue to employ resources to compromise U.S. security defenses.

1. Social Networks—Past and Present

The sociometry research in the 1969 Travers and Milgram acquaintance chain experiment, (Travers & Milgram, 2006) demonstrated the power of human social network connectedness. Although not so named until later, the examination of "degrees of separation" illustrated the power of human social networking, and specifically the knowledge of the network—how, who, where—in

order to obtain the experiment's information packets to the target by the most direct route. While the experiment's objective was trivial, its implications remain significant.

Social networking power increased in proportion to its usage. In today's society of decreasing face-to-face interactions, the electronic social network provides an opportunity for sharing knowledge, and a method for reaching intended targets, whether for delivery of packages, or for soliciting knowledge, or for collaboration to discover new knowledge. Electronic or traditional, social networking facilitates connectedness among people beyond the reaches of immediately familiar people.

While there are distinct advantages for face-to-face social interactions such as facial expressions and tone of voice, such meetings are not always convenient in a combat operation. Thus, social networking by automated information system methods is a logical substitute.

Our adversaries use electronic social networks for exchanging information and planning their operations. Thus, the Navy's traditional methods of cooperative communication may not be adequate. A slow and cumbersome information-sharing loop will adversely affect decision-making cycles. What does the U.S. need to do in order to leapfrog beyond the collaboration freely available to the adversaries? And will the DoD leadership be open to such changes? Specifically, what is the Navy leadership's perception of social networking applicability to combat operations?

2.   Data Collection to Examine Perceptions

A research study was conducted to ascertain the Navy leadership's perceptions of electronic social networking applicability to combat operations. Data was collected from senior Navy "flag" officers through interviews, and compared with data obtained through surveys of junior Navy officers "operators" (Ensign to Lieutenant Commander) of the Information Professional and Human Resource communities.

In the initial review of response, this study's authors were impressed with the genuine subject matter interest indicated by the respondents' answers. The timing of this study coincided with release of DoD memorandum DTM-09-026, *Responsible and Effective Use of Internet-Based Capabilities* (25 FEB 2010). While preliminary, the memorandum provides broad guidance on use of defense information systems for social networking throughout the Department. DoD will likely release detailed guidance soon; each service branch will subsequently amplify the matter with additional guidance.

3.   Perceptions of Social Networking

The senior officers interviewed were active in traditional social networks, including professional organizations, yet the wardroom and officer clubs received limited reference. Several senior officers mentioned official meetings and civic club engagements as opportunities to exchange ideas and solutions to problems. In addition to these venues, the authors suggest that lunch meetings and chats in the passageway provide additional access to network knowledge. The point is that colleagues likely know someone who has unique access to a solution not previously known to the initial network inquirers. The seniors specifically mentioned the relevance of networking for both personal and

professional growth. Overall, senior officers interviewed spend on average 8.5 hours per month participating in "face-to-face" networking.

The junior officers surveyed mentioned both wardrooms and officer clubs as part of their portfolio of traditional networking venues, and 50 percent of this group stated they spend 1–6 hours each month participating. However, the junior officers did not mention traditional social networking when discussing the applicability to their jobs. When comparing the junior officer traditional network participation with that of the seniors, the juniors were less likely to be in as many networks.

The number of online social networks that senior officers use ranged from 0-7. Facebook was listed as the most popular, with Twitter close behind. On average, seniors spent 24 hours each month using electronic social networks. In comparison, the majority of junior officers spent just 1-2 hours per week (or 4–8 hours per month) networking online. Their favorite online venues included Facebook, NKO/DKO, and LinkedIn. Note: when preparing this study, the authors provided NKO/DKO as an example of online networking to the survey takers. However, the specifics as to whether chat, discussion forums, or simply using the online training was what the junior officers had in mind when selecting NKO/DKO is not clear.

Online chat has been demonstrated to be a valuable tool for coordinating complex mission operations. Imagine the potential when combining a chat system with social media tools for sharing of knowledge across a combat team. The interviewees described this very scenario. The principal concern shared by most participants was of risk management. The risks, as pointed out by RADM J. Hamby (Chapter 4, "Benefit Versus Risk"), can be addressed, and the end-users can be educated on proper network

skills to obtain the benefit from the system, while preventing exposure of themselves, their equipment and their mission to threat.

B. FUTURE AREAS OF RESEARCH

Many arenas of social networking still need exploration. If sharing information is going to become a top priority for the U.S. Government, then innovative methods to move information must be considered.

1. Trust as a Sharing Metric

The authors identified trust as an essential element to what makes social networks function. Trust is so integral to the strength of ties that it supersedes many other factors when analyzing a network. Sharing of information is directly proportional to the amount of trust (organizational or personal) that an individual places in someone.

The authors first discovered Social Network Analysis (SNA) after attending a lecture given by Dr. Karen Stephenson in 2009 on the role of trust in organizations. During her talk, one theme recurred over and over—the importance of trust in a social network. Trust enables a connection between participants (nodes), allowing a transaction to take place. Without it, people are hesitant to share information, especially valuable information. Trust applies both internally and externally to any organization. Sometimes, there is distrust even within the normal reporting chain. This is most severe in organizational hierarchies where decision-making occurs at the top, yet the necessary information to make the right decision languishes below. A three-star admiral noted, "I can lead men and women into battle, but I am a prisoner of war in my own organization." (Stephenson, 2009)

If trust could be accurately measured, the guesswork could be eliminated. Determining which agencies, coalition partners, and allies are privy to certain information is as simple as assigning levels of trust to that information and then checking for who is authorized to view the information. This process would take place in addition to classification and could be automated based on meta tags for each file. The activities within social networking are ongoing. Assigning levels of trust greatly improves the capacity to share information with the right people in a network.

2.   Impact of Technology Adoption for the Navy

The Navy prides itself as being on the forefront of emerging technologies that contribute to future operational concepts for the Navy-Marine Corps team. The adoption of innovative technologies is a double-edged sword however; new capabilities are at the disposal of the warfighter, but they often come at the price of time, people, and resources to integrate it into the fleet. There is a learning curve that must be overcome before a technology begins to reap dividends. Training the force to use a new tool is typically accomplished through Tactics, Training, and Procedure (TTP) doctrine, which over time (often by learning from our own mistakes) become integrated into the way the U.S. Navy does business.

Training the Navy workforce, while extremely technical and competent with IT, is necessary. If sailors do not get trained on how to properly use these tools, the Navy will only have itself to blame when it goes awry. "It's a pretty responsible workforce," DoD CIO Wennergren states, "You've got to be able to use these tools, but you need to use them thoughtfully." (McMichael, 2010) If the Navy addresses concerns about OPSEC and network security, it should start by teaching its operators how to use social networks tactically. Chiefly, Navy leadership

should aim to maximize social networking benefits such as speed of communication and transparency while minimizing security risks.

If the user is expected to use social networking tools thoughtfully, then the tools must also be designed thoughtfully. Considerable thought should be given to the requirements for military social networking, how they will be employed, and the user interface. Not every operator will a desk if this tool is used tactically, personnel in the field may have small handheld devices with which to post real-time updates. What will social networking look like for the Marine on the beach or for the battle watch captain onboard an aircraft carrier? They probably look different, each with its unique requirements and features. Human systems integration must be considered if social networking is to become a useful tool in the warfighter's arsenal.

3.   Valued Information at the Right Time (VIRT)

The concept of VIRT, developed by Hayes-Roth, addresses the issue of excess information to the decision maker. When collaborating in a time-stressed environment, the ability to filter out information is critical. By assigning value to bits, based on user-selected criteria, information can be prioritized for purposes of transport and consumption (Hayes-Roth, 2005). What if that concept could be used to filter traffic in a trust-based social network?

Using dynamic filters specified by an operator, one could quickly find information being posted real time by other operators in a shared network. VIRT would essentially isolate the "wheat from the chaff" and present the warfighter with only the relevant tactical information needed to make a decision. Each operator is able to set their own keywords and filters in

place that suit their needs. In this manner, perishable information like observed enemy movements or the locations of persons of interest could be easily sifted from even the busiest of social networks. The power here is that participants can post as much tactical information as they want without fear of adding unwanted noise into another operator's feed.

4. Social Networking as a Force Management Tool?

Social networking has many applications, but public affairs and recruitment are natural fits. In the same way the business sector has capitalized on advertising and marketing with social networking tools, the military has started its own campaign in reaching its target audience for recruiting — America's youth. In fact, using social networking for public affairs activities and online presence is specifically mentioned in DoD memorandum DTM-09-026 (U.S. Deputy Secretary of Defense, 2010).

If the Navy would use social networking to moderate discussion on force management issues, it would bring all the stakeholders together into a single dialogue. Instead of point-to-point conversations and infrequent meetings, a social networking thread could allow all the stakeholders to express their questions and concerns in a transparent and real-time fashion. Issues always arise after a meeting has taken place and now there is a forum to provide the decision maker with the most current and complete information.

5. Knowledge/Skill Management

Managing the unique skill set of our military forces is an evolving process. The Navy is "unmanning" the front lines with increasing audacity, removing people from traditional roles and replacing them with technology. Naval leaders continue to reduce force size with the advent of unmanned vehicles,

automated bridges on ships, and precision weaponry. Soon, operators will discover communicating effectively is not so easy anymore. A ship requiring a crew of 300 sailors to operate now takes 30. Replacing people with technology onboard the ship is not equivalent to a one-to-one swap. Institutional knowledge will be lost as each person departs is removed from a manned position. Specifically, the tacit knowledge will be difficult to replicate in an IT system. The wisdom of the Chief's Mess, as well as the creative problem-solving approaches of a seasoned Second-Class Petty Officer will be difficult to replicate.

It is important to realize that more support for our forward deployed units is going to be necessary. If a system breaks, will there be a technician among a crew of 30 who can make the repair? Is the Navy willing to accept reduced mission effectiveness while a repair party is dispatched to the middle of the ocean? One possible solution is using social networks to distribute expertise and the requisite knowledge remotely. Using reach back for support can bridge the increasing gap of manning levels and required skills by leveraging communities of practice. This is not trivial; however, the Navy leadership assumes a great deal of risk as the front lines continue to be "unmanned".

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APPENDIX A

List of Various DoD Social Networking Links:

- http://socialmedia.defense.gov/

- http://www.defense.gov/home/features/2009/0709_socialmedia/

- http://www.dtic.mil/whs/directives/corres/pdf/DTM-09-026.pdf

- http://twitter.com/DefenseGov/

- http://www.dodlive.mil/

- http://www.navy.mil/media/smd.asp

- http://www.doncio.navy.mil/PolicyView.aspx?ID=789

- http://twitter.com/navynews/

- http://twitter.com/CNOAdmRoughead

Facebook page of Admiral Mullen, Chairman of the Joint Chiefs of Staff (16 March 2010, 2112 PDT).

Facebook page of Admiral Stavridis, Commander, United States European Command and Supreme Allied Commander, Europe (16 March 2010, 2120 PDT).

Twitter page of ADM Mullen, Chairman of the Joint Chiefs of Staff (17 March 2010, 0628 PDT).

Twitter page of Navy IPs (17 March 2010, 0626 PDT).

Twitter page of U.S. European Command (17 March 2010, 0623 PDT).

Twitter page of U.S. Pacific Command (16 March 2010, 2132 PDT).

APPENDIX B

The following interview questions were presented to senior officers to solicit their perceptions of social networks.

INTERVIEW ON SOCIAL NETWORKING

Recall that for the purposes of this study, we define traditional social networks as forums where information, experiences and opinions are exchanged largely face-to-face.

We define electronic social networks as collaborative tools that behave similarly to traditional networks, though with information technology at the heart of a computer-mediated exchange.
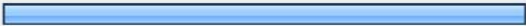
1. In which traditional social networks (e.g., Kiwanis, Lions Club, NNOA, MOAA, AFCEA, the Officers' Mess, etc) do you routinely participate?

2. In which electronic social networks (e.g., Facebook, Twitter, LinkedIn, NKO/DKO, DCO, etc) do you routinely participate?

3. How much time would you estimate you spend monthly in traditional social networks? What motivates you to invest this time (e.g., information, opportunities to mentor, maintaining professional contacts, etc)?

4. How much time would you estimate you spend monthly in electronic social networks? What motivates you to invest this time? Are there aspects of traditional social networks that you find are missing or poorly implemented in these electronic social networks? Are there aspects of these electronic networks that you believe are more effective than traditional networks?

5. With respect to electronic social networks, how do you and your staff filter the volume of message traffic coming in? How do you manage outgoing traffic? Do you find your own
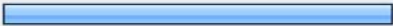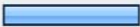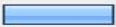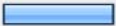
use of the electronic networks to be balanced between transmit and receive (e.g., 50/50); more transmit; or more receive?
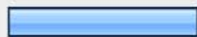
6. With respect to military operations, do you believe that electronic social networking has the potential to improve joint capabilities (e.g., doctrine, organization, training and education, leadership, and personnel)? Do you see risks in these open electronic networks that might make potential benefits less attractive?
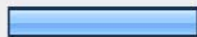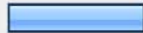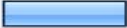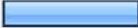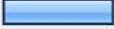
The following are survey questions posed to junior officers from both Human Resource and Information Professional communities at Naval Postgraduate School, along with response statistics generated by "Survey Monkey" (http://www.surveymonkey.com), a third party web survey tool.
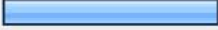
1. By selecting "Yes" you consent to the terms above, understand the risks involved, and agree to proceed with the survey.

	Response Percent	Response Count
Yes	100.0%	40
No	0.0%	0
	answered question	40
	skipped question	1
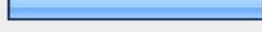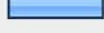
2. Are you currently or have you been a member of any of these traditional networks (Face-to-Face)? You may select more than one answer.

	Response Percent	Response Count
Wardroom	74.4%	29
Officer's Club	25.6%	10
Freemasonry	12.8%	5
NNOA	20.5%	8
AFCEA	12.8%	5
Lions Club	2.6%	1
Kiwanis	2.6%	1
MOAA	12.8%	5
None	20.5%	8
Other (please specify)	15.4%	6
	answered question	39
	skipped question	2
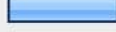
3. Per month, approximately how much time do you spend participating in traditional social networking activities?

		Response Percent	Response Count
None		35.9%	14
1-2 hours		25.6%	10
3-6 hours		25.6%	10
6-12 hours		5.1%	2
12+ hours		7.7%	3
		answered question	39
		skipped question	2
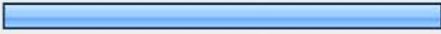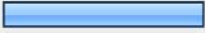
4. Of the time spent using traditional social networks, how much of it pertains to business / work?

		Response Percent	Response Count
1-25%		35.9%	14
25-50%		28.2%	11
50-75%		2.6%	1
75-100%		7.7%	3
None		25.6%	10
		answered question	39
		skipped question	2

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
5. Of the time spent using traditional social networks, how much of it pertains to recreation?

		Response Percent	Response Count
1-25%		12.8%	5
25-50%		23.1%	9
50-75%		**25.6%**	**10**
75-100%		17.9%	7
None		20.5%	8
	answered question		39
	skipped question		2

6. You feel time spent on traditional social networking reaps substantial career benefits.

		Response Percent	Response Count
Strongly Disagree		2.6%	1
Disagree		2.6%	1
Neither Agree Nor Disagree		38.5%	15
Agree		**41.0%**	**16**
Strongly Agree		15.4%	6
	answered question		39
	skipped question		2

7. You build professional relationships through traditional social networks.

		Response Percent	Response Count
Strongly Disagree		2.6%	1
Disagree		7.7%	3
Neither Agree Nor Disagree		23.1%	9
Agree		**48.7%**	**19**
Strongly Agree		17.9%	7
	answered question		39
	skipped question		2

8. You would lose touch with valuable colleagues if you did not spend time in traditional networks.

		Response Percent	Response Count
Strongly Disagree		5.1%	2
Disagree		30.8%	12
Neither Agree Nor Disagree		20.5%	8
Agree		**38.5%**	**15**
Strongly Agree		5.1%	2
	answered question		39
	skipped question		2
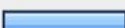
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9. Are you currently or have you been a member of any of these electronic networks? You may select more than one answer.

			Response Percent	Response Count
Facebook			83.8%	31
LinkedIn			37.8%	14
GovLoop			0.0%	0
SIPRnet collaborative tools			13.5%	5
Navy/Defense Knowledge Online (NKO/DKO)			78.4%	29
Defense Connection Online (DCO)			13.5%	5
Other (please specify)			10.8%	4
		answered question		37
		skipped question		4

10. Per Week, how much time do you spend using online social networks?

			Response Percent	Response Count
None			12.8%	5
1-2 hours			38.5%	15
3-6 hours			28.2%	11
6-12 hours			15.4%	6
12+ hours			5.1%	2
		answered question		39
		skipped question		2

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**11. Of the time spent using online social networking, how much of it pertains to business / work?**

	Response Percent	Response Count
1-25%	43.6%	17
25-50%	23.1%	9
50-75%	0.0%	0
75-100%	2.6%	1
None	30.8%	12
answered question		39
skipped question		2

12. Of the time spent using online social networking, how much of it pertains to recreation?

	Response Percent	Response Count
1-25%	5.1%	2
25-50%	2.6%	1
50-75%	33.3%	13
75-100%	46.2%	18
None	12.8%	5
answered question		39
skipped question		2

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13. If online social networking were integrated into your workplace, it would significantly increase your ability to get things done.

	Response Percent	Response Count
Strongly Disagree	12.8%	5
Disagree	17.9%	7
Don't Know	30.8%	12
Agree	**33.3%**	**13**
Strongly Agree	5.1%	2
answered question		39
skipped question		2

14. Online social networking is a detriment to productivity in the work place, and causes headaches for management.

	Response Percent	Response Count
Strongly Disagree	7.7%	3
Disagree	**33.3%**	**13**
Don't Know	23.1%	9
Agree	25.6%	10
Strongly Agree	10.3%	4
answered question		39
skipped question		2

15. Does online social networking provide value to the warfighter? How?		Response Count
		32
	answered question	32
	skipped question	9

16. Consider both Traditional and Electronic Networks. Can you provide an example of how social networking has influenced your career, either positive or negative? (E.g. job you got, opportunity you heard about, etc.)		Response Count
		28
	answered question	28
	skipped question	13

For more information on Survey Monkey's privacy policy, please visit the following link:

http://www.surveymonkey.com/HelpCenter/Answer.aspx?HelpID=42

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